

BF

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
16 October 2003 (16.10.2003)

PCT

(10) International Publication Number  
**WO 03/084916 A2**(51) International Patent Classification<sup>7</sup>: **C07C 59/70**,  
317/22, 323/19, C07D 209/10, 213/20, 213/32, 261/08,  
311/58, 405/12, 413/12, A61K 31/19, A61P 3/06, 9/10(21) International Application Number: **PCT/IB03/01121**

(22) International Filing Date: 24 March 2003 (24.03.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/370,508 5 April 2002 (05.04.2002) US  
60/386,026 5 June 2002 (05.06.2002) US(71) Applicant (for all designated States except US):  
**WARNER-LAMBERT COMPANY LLC** [US/US];  
201 Tabor Road, Morris Plains, NJ 07950 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **FILZEN, Gary, Frederick** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **TRIVEDI, Bharat, Kalidas** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **GEYER, Andrew, George** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **UNANGST, Paul, Charles** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **BRATTON,****Larry, Don** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **AUERBACH, Bruce, Jeffrey** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US).(74) Agent: **LUMB, J., Trevor**; Pfizer Inc., 201 Tabor Road, Morris Plains, NJ 07950 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 03/084916 A2

(54) Title: COMPOUNDS THAT MODULATE PPAR ACTIVITY AND METHODS FOR THEIR PREPARATION

(57) Abstract: This invention discloses compounds that alter PPAR activity. The invention also discloses pharmaceutically acceptable salts of the compounds, pharmaceutically acceptable compositions comprising the compounds or their salts, and methods of using them as therapeutic agents for treating or preventing hyperlipidemia, hypercholesterolemia, obesity, eating disorders, hyperglycemia, atherosclerosis, hypertriglyceridemia, hyperinsulinemia and diabetes in a mammal as well as methods of suppressing appetite and modulating leptin levels in a mammal. The present invention also discloses methods for making the disclosed compounds.

-1-

## COMPOUNDS THAT MODULATE PPAR ACTIVITY AND METHODS FOR THEIR PREPARATION

5 This application claims priority to U.S. Provisional Applications Serial Nos.  
60/370,508, filed April 5, 2002 and 60/386,026, filed June 5, 2002.

### FIELD OF THE INVENTION

10 The present invention relates to compounds and pharmaceutical formulations  
that can be used to treat conditions mediated by nuclear hormone receptors, more  
specifically, to compounds and pharmaceutical formulations that modulate  
Peroxisome Proliferator Activation Receptor (PPAR) activity.

### 15 BACKGROUND OF THE INVENTION

Hypercholesterolemia, dyslipidemia, diabetes, and obesity are well-  
recognized risk factors in the onset of atherosclerosis and coronary heart disease. The  
diseases are characterized by high levels of cholesterol and lipids in the blood. The  
20 blood cholesterol pool is generally dependent on dietary uptake of cholesterol from  
the intestine, and from the biosynthesis of cholesterol throughout the body, especially  
the liver. The majority of cholesterol in plasma is carried on apolipoprotein B-  
containing lipoproteins, such as low-density lipoproteins (LDL) and very-low-density  
lipoproteins (VLDL). The risk of coronary artery disease in man increases when  
25 LDL and VLDL levels increase. Conversely, high levels of cholesterol carried in  
high-density lipoproteins (HDL) is protective against coronary artery disease (Am. J.  
Med., 1977;62:707-714).

-2-

The statins represent perhaps the most important class of lipid-lowering drugs. These compounds inhibit HMG-CoA reductase which is implicated in the rate-limiting step in cellular cholesterol biosynthesis. Representative statins include atorvastatin, lovastatin, pravastatin, and simvastatin. The effectiveness of these compounds depends on LDL receptor regulation. Other important antilipidemia drugs include fibrates such as gemfibрил and clofibrate, bile acid sequestrants such as cholestyramine and colestipol, probucol, and nicotinic acid analogs.

To date, a number of oral antidiabetic agents have been developed. The most commonly used hypoglycemic drugs are the sulfonylureas. Sulfonylureas are generally used to stimulate insulin. The biguanide metformin is generally used to improve insulin sensitivity and to decrease hepatic glucose output. Acarbose is used to limit postprandial hyperglycemia. Thiazolidine 2,4 diones are used to enhance insulin action without increasing insulin secretion.

Obesity is a chronic disease that is highly prevalent in modern society and is associated not only with a social stigma, but also with decreased life span and numerous medical problems, including diabetes mellitus, insulin resistance, hypertension, hypercholesterolemia, thromboembolic disease, and coronary heart disease. Rissanen et al, British Medical Journal, 301:835-837 (1990). Treatment of obesity remains a problem and it is unclear whether dieting results in decreased long-term risk of early death. A further important obesity intervention is physical activity. Exercise, however, in general, has been found to be only moderately successful in promoting weight loss. A program combining both dieting and exercise as well as behaviour modification is widely viewed as the optimal approach to weight loss. Studies have demonstrated that the combination of both food restriction and exercise promote a substantial loss of fat while maintaining lean tissue.

-3-

Peroxisome Proliferator Activation Receptors (PPAR) are implicated in a number of biological processes and disease states including hypercholesterolemia, dyslipidemia, and diabetes. PPARs are members of the nuclear receptor superfamily of transcription factors that includes steroid, thyroid, and vitamin D receptors. They play a role in controlling expression of proteins that regulate lipid metabolism. Furthermore, the PPARs are activated by fatty acids and fatty acid metabolites. There are three PPAR subtypes PPAR  $\alpha$ , PPAR  $\beta$  (also referred to as PPAR  $\delta$ ), and PPAR  $\gamma$ . Each receptor shows a different pattern of tissue expression, and differences in activation by structurally diverse compounds. PPAR  $\gamma$ , for instance, is expressed most abundantly in adipose tissue and at lower levels in skeletal muscle, heart, liver, intestine, kidney, vascular endothelial and smooth muscle cells as well as macrophages. PPAR receptors are associated with regulation of insulin sensitivity and blood glucose levels, macrophage differentiation, inflammatory response, and cell differentiation. Accordingly, PPARs have been associated with obesity, diabetes, carcinogenesis, hyperplasia, atherosclerosis, dyslipidemia, and hypercholesterolemia.

In addition, PPAR $\alpha$  agonists lower plasma triglycerides and LDL cholesterol and are therefore useful in treating hypertriglyceridemia, dyslipidemia and obesity. PPAR  $\gamma$  is associated with the development of non-insulin-dependent diabetes mellitus (NIDDM), hypertension, coronary artery disease, dyslipidemia and certain malignancies. Finally, activation of PPAR  $\beta$  has been demonstrated to increase HDL levels. (Leibowitz, WO97/28149, Aug. 1997.) More recently, a PPAR  $\beta$  selective agonist was reported to have shown a dose-related increase in serum HDL-C and decrease in LDL-C and VLDL-TG in insulin-resistant middle aged rhesus monkeys. (W. R. Oliver et al., PNAS, v. 98, pp. 5306-5311, 2001)

Antilipidemic, antidiabetic and anti-obesity agents are still considered to have non-uniform effectiveness. The effectiveness of antidiabetic and antilipidemic therapies is limited, in part because of poor patient compliance due to unacceptable



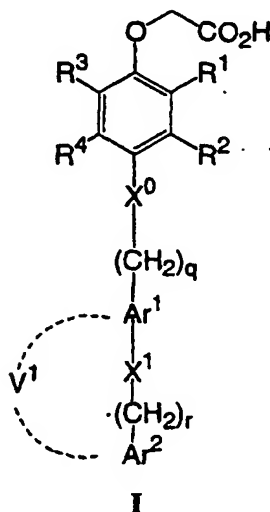
-4-

side effects. These side effects include diarrhea and gastrointestinal discomfort, and in the case of antidiabetics, edema, hypoglycemia and hepatotoxicity. Furthermore, each type of drug does not work equally well in all patients.

5 For the reasons set forth above, there is a need for novel antilipidemic, antidiabetic, and anti-obesity agents that can be used alone or in combination. Furthermore, activation of multiple PPARs, for instance, PPAR $\beta$  alone or in combination with the simultaneous activation of PPAR  $\alpha$  and/or PPAR  $\gamma$ , may be desirable in formulating a treatment for dyslipidemia in which HDL is increased and  
10 LDL lowered.

#### SUMMARY OF THE INVENTION

The present invention provides compounds capable of modulating PPAR  
15 activity. Compounds of the present invention are described by Formula I:

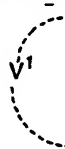
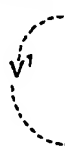


20 and pharmaceutically acceptable salts thereof, where:

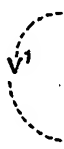
-5-

$X^0$  and  $X^1$  are independently absent, O, S,  $-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{CH}\equiv\text{CH}-$ ,  $-\text{S}(\text{O})_2-$ , or  $-\text{S}(\text{O})-$ ;

$\text{Ar}^1$  and  $\text{Ar}^2$  are each independently unsubstituted or substituted aryl or heteroaryl, provided that  $\text{Ar}^1$  is not thiazolyl or oxazolyl;



5 is absent; or when present, is a saturated or unsaturated hydrocarbon chain which is substituted or unsubstituted, wherein said chain has from



1 to 4 atoms so that ,  $\text{Ar}^1$ ,  $X^1$ ,  $(\text{CH}_2)_r$ , and  $\text{Ar}^2$ , together form a five to eight membered ring;

10  $\text{R}^1$  and  $\text{R}^2$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $\text{O}-(\text{CH}_2)_m\text{CF}_3$ , halogen, nitro, cyano,  $-\text{OH}$ ,  $-\text{SH}$ ,  $-\text{CF}_3$ ,  $-\text{S}(\text{O})_p\text{alkyl}$ ,  $\text{S}(\text{O})_p\text{aryl}$ ,  $-(\text{CH}_2)_m\text{OR}^5$ ,  $-(\text{CH}_2)_m\text{NR}^6\text{R}^7$ ,  $-\text{COR}^5$ ,  $-\text{CO}_2\text{R}^5$ , or  $-\text{NR}^6\text{R}^7$ , or together with the atoms to which they are attached form a five to eight member ring;

15  $\text{R}^3$  and  $\text{R}^4$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $\text{O}-(\text{CH}_2)_m\text{CF}_3$ , halogen, nitro, cyano,  $-\text{OH}$ ,  $-\text{SH}$ ,  $-\text{CF}_3$ ,  $-\text{S}(\text{O})_p\text{alkyl}$ ,  $\text{S}(\text{O})_p\text{aryl}$ ,  $-(\text{CH}_2)_m\text{OR}^5$ ,  $-(\text{CH}_2)_m\text{NR}^6\text{R}^7$ ,  $-\text{COR}^5$ ,  $-\text{CO}_2\text{H}$ ,  $-\text{CO}_2\text{R}^5$ , or  $-\text{NR}^6\text{R}^7$ ;

provided that at least one of  $\text{R}_1$ - $\text{R}_4$  is H, lower alkyl, lower alkoxy, haloalkyl,  $\text{O}-(\text{CH}_2)_m\text{CF}_3$ , halogen, nitro, cyano,  $-\text{OH}$ ,  $-\text{SH}$ ,  $-\text{CF}_3$ ,  $-\text{S}(\text{O})_p\text{alkyl}$ ,  $\text{S}(\text{O})_p\text{aryl}$ ,  $-(\text{CH}_2)_m\text{OR}^5$ ,  $-(\text{CH}_2)_m\text{NR}^6\text{R}^7$ , or  $\text{NR}^6\text{R}^7$ ;

$\text{R}^5$  is hydrogen, alkyl, alkenyl, alkynyl, or aryl;

20  $\text{R}^6$  and  $\text{R}^7$  are each independently hydrogen, alkyl, alkenyl, alkynyl,  $-\text{COalkyl}$ ,  $-\text{COaryl}$ , cycloalkyl,  $-\text{CO}_2\text{alkyl}$ ,  $-\text{CO}_2\text{aryl}$ , or  $\text{R}^6$  and  $\text{R}^7$  together with the atoms to which they are attached form a 4 to 7 membered ring having 1 to 3 heteroatoms;

$m$  is 0 to 5;

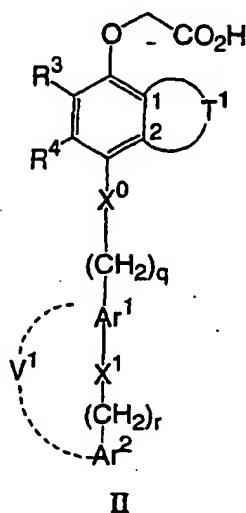
$p$  is 0, 1, or 2;

25  $q$  is 0 to 6; and

-6-

$r$  is 0 to 6.

The invention also provides a compound of formula (II):



and pharmaceutically acceptable salts thereof, where:

$X^0$  and  $X^1$  are independently absent, O, S,  $-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{CH}\equiv\text{CH}-$ ,  $-\text{S}(\text{O})_2-$ , or  $-\text{S}(\text{O})-$ ;

10  $\text{Ar}^1$  and  $\text{Ar}^2$  are each independently unsubstituted or substituted aryl or heteroaryl, provided that  $\text{Ar}^1$  is not thiazolyl or oxazolyl;



is absent; or when present,



is a saturated or unsaturated

hydrocarbon chain which is substituted or unsubstituted, wherein said chain has from



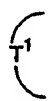
15 1 to 4 atoms so that  $\text{Ar}^1$ ,  $X^1$ ,  $(\text{CH}_2)_r$ , and  $\text{Ar}^2$ , together form a five to eight member ring;

-7-

$R^3$  and  $R^4$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $O-(CH_2)_mCF_3$ , halogen, nitro, cyano,  $-OH$ ,  $-SH$ ,  $-CF_3$ ,  $-S(O)_palkyl$ ,  $S(O)_paryl$ ,  $-(CH_2)_mOR^5$ ,  $-(CH_2)_mNR^6R^7$ ,  $-COR^5$ ,  $-CO_2H$ ,  $-CO_2R^5$ , or  $-NR^6R^7$ ;

$R^5$  is hydrogen, alkyl, alkenyl, alkynyl, or aryl;

5  $R^6$  and  $R^7$  are each independently hydrogen, alkyl, alkenyl, alkynyl,  $-COalkyl$ ,  $-COaryl$ , cycloalkyl,  $-CO_2alkyl$ ,  $-CO_2aryl$ ,  $-SO_2alkyl$ ,  $-SO_2aryl$ , or  $R^6$  and  $R^7$  together with the atoms to which they are attached form a 4 to 7 membered ring having 1 to 3 heteroatoms;



10  $T^1$  is a saturated or unsaturated, substituted or unsubstituted hydrocarbon chain or hydrocarbon-heteroatom chain having from 3 to 6 atoms wherein the carbon atom of position 2 is connected to the carbon atom of position 3 to form a five to eight member ring;

$m$  is 0 to 5;

$p$  is 0 to 2;

15  $q$  is 0 to 6; and

$r$  is 0 to 6.

In still another embodiment of the present invention, a method of treating, preventing or controlling hypercholesterolemia and dyslipidemia in a mammal is provided. The method comprises administering to the mammal in need thereof a therapeutically effective amount of the compounds of the present invention.

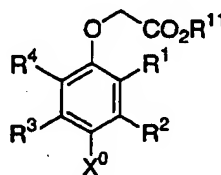
20 Additionally, the compounds of the present invention are also useful in the method of the present invention for treating, preventing, or controlling obesity, eating disorders, hyperglycemia, atherosclerosis, hypertriglyceridemia, hyperinsulinemia and diabetes.

25 Furthermore, the compounds of the present invention are also useful in the methods of suppressing appetite in a mammal, modulating leptin levels in a mammal, and treating a patient exhibiting glucose disorders associated with circulating glucocorticoids, growth hormone, catecholamines, glucagon, or parathyroid hormone.

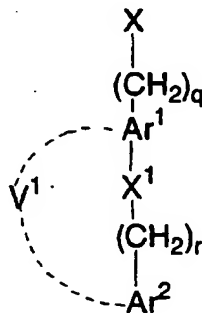
-8-

For each disease state treatable, preventable, or controllable by the method of the present invention, a therapeutically effective amount of the compounds of the present invention are administered to the mammal in need thereof.

- 5 In yet another embodiment of the present invention, a method for preparing compounds with Formulae I-II, or a pharmaceutically acceptable salt thereof, is provided. The method of this embodiment comprises reacting



- 10 in a solvent in the presence of a base such as cesium carbonate; with



where

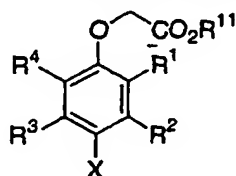
15

$X^0$  is OH or SH;

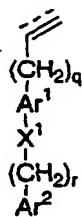
20  $n, q, r, R^1, R^2, R^3, R^4, X^1$ ,  
Formula I;  
 $R^{11}$  is a lower alkyl; and  
 $X$  is a halogen.

-9-

In yet another embodiment of the present invention, an alternative method for preparing compounds with Formulae I-II, or a pharmaceutically acceptable salt thereof, is provided. The method of this embodiment comprises reacting

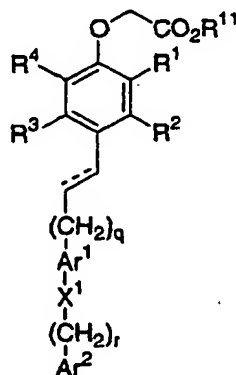


5 where X is a halide, R<sub>1</sub>-R<sub>4</sub> have any of the meanings defined above, and R<sup>11</sup> is a lower alkyl with:



where --- is a bond or is absent and wherein n, q, r, X<sup>0</sup>, X<sup>1</sup>, Ar<sup>2</sup> are as defined above for Formula I;

10 in the presence of a catalyst such as a palladium catalyst to form

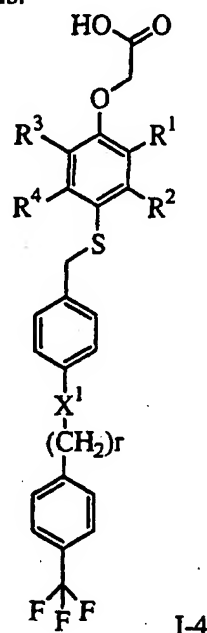


where --- is a bond or is absent.

-10-

The double bond may optionally be removed, for instance, by hydrogenation and the resulting ester is preferably hydrolyzed to form the compounds of Formulas I or II.

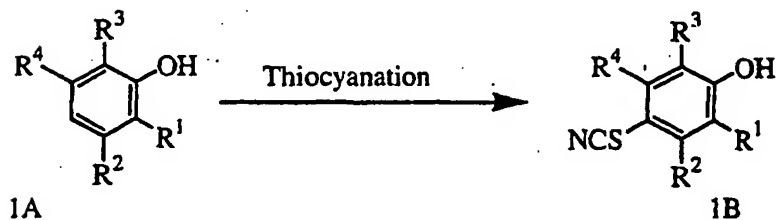
- 5 In still another embodiment, the invention provides a process for preparing the compound of formula I-4 which is:



or a pharmaceutically acceptable salt thereof, comprising:

- (a) conversion of phenol 1A to the thiocyanate 1B;

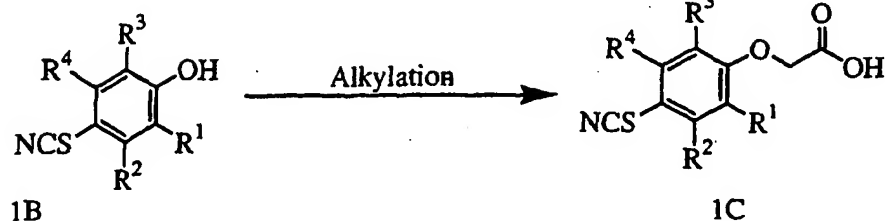
10



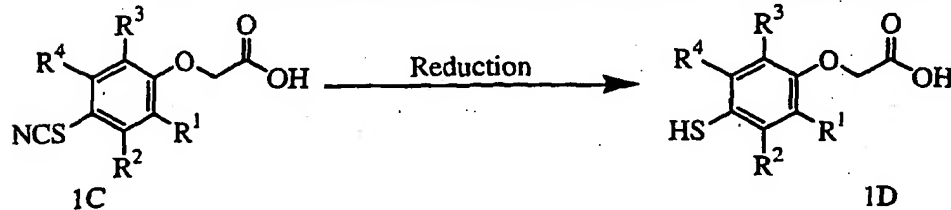
-11-

(b) alkylation of phenol moiety of thiocyanate 1B to acetoxyster

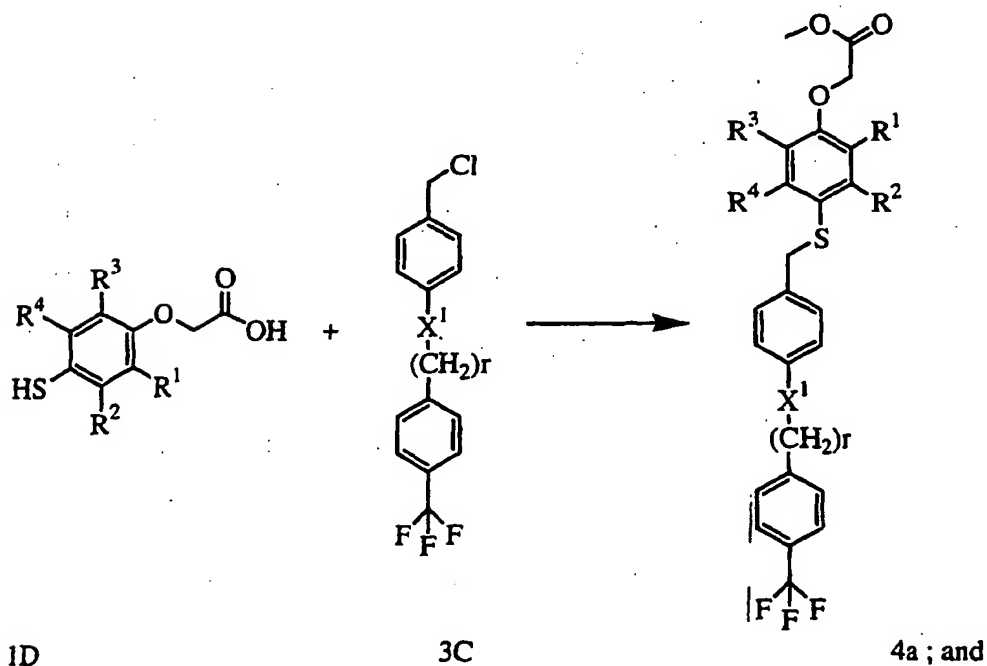
1C;



(c) reduction of the thiocyanate moiety in 1C to form thiol 1D;



(d) alkylation of thiol 1D with chloride 3C to form 4a;



(e) saponification of the ester moiety in 4a to form I-4;

where



-12-

R<sup>1</sup> is hydrogen or together with R<sup>2</sup> forms a 5 membered carbocyclic ring;  
R<sup>2</sup> is methoxy or together with R<sup>1</sup> forms a 5 membered carbocyclic ring;  
R<sup>3</sup> is hydrogen or methyl;  
R<sup>4</sup> is hydrogen;  
X<sup>1</sup> is absent or O; and  
r is 0 or 1.

## DETAILED DESCRIPTION OF THE INVENTION

The following definitions are used, unless otherwise described: halo is fluoro, chloro, bromo, or iodo. Alkyl, alkoxy, alkenyl, alkynyl, etc. denote both straight and branched groups; but reference to an individual radical such as "propyl" embraces only the straight chain radical, a branched chain isomer such as "isopropyl" being specifically referred to.

The term "alkyl" as used herein refers to a straight or branched hydrocarbon of from 1 to 11 carbon atoms and includes, for example, methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, isobutyl, *tert*-butyl, n-pentyl, n-hexyl, and the like. The alkyl group can also be substituted with one or more of the substituents selected from lower alkoxy, lower thioalkoxy, -O(CH<sub>2</sub>)<sub>1-5</sub>CF<sub>3</sub>, halogen, nitro, cyano, =O, =S, -OH, -SH, -CF<sub>3</sub>, -OCF<sub>3</sub>, -CO<sub>2</sub>H, -CO<sub>2</sub>C<sub>1-6</sub> alkyl, -NH<sub>2</sub>, -NHC<sub>1-6</sub> alkyl, -CONR'R", or -N(C<sub>1-6</sub>alkyl)<sub>2</sub> where R' and R" are independently alkyl, alkenyl, alkynyl, aryl, or joined together to form a 4 to 7 member ring. Preferred alkyl groups have from 1 to 6 carbon atoms (C<sub>1-6</sub> alkyl).

The term "lower alkyl" as used herein refers to a subset of alkyl which means a straight or branched hydrocarbon radical having from 1 to 6 carbon atoms and includes, for example, methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, isobutyl, *tert*-butyl, n-pentyl, n-hexyl, and the like. Optionally, herein lower alkyl is referred to as "C<sub>1-6</sub>alkyl."

-13-

The term "haloalkyl" as used herein refers to a lower alkyl radical, as defined above, bearing at least one halogen substituent, for example, chloromethyl, fluoroethyl, trifluoromethyl, or 1,1,1-trifluoroethyl and the like. Haloalkyl can also include perfluoroalkyl wherein all hydrogens of a loweralkyl group are replaced with fluorine atoms.

The term "alkenyl" means a straight or branched unsaturated hydrocarbon radical having from 2 to 12 carbon atoms and includes, for example, ethenyl, 1-propenyl, 2-propenyl, 1-butenyl, 2-butenyl, 1-pentenyl, 2-pentenyl, 3-methyl-3-butenyl, 1-hexenyl, 2-hexenyl, 3-hexenyl, 3-heptenyl, 1-octenyl, 1-nonenyl, 1-decenyl, 1-undecenyl, 1-dodecenyl, and the like.

The term "alkynyl" means a straight or branched hydrocarbon radical having from 2 to 12 carbon atoms having at least one triple bond and includes, for example, 1-propynyl, 1-butyne, 3-butyne, 1-pentyne, 3-pentyne, 3-methyl-3-butyne, 1-hexynyl, 3-hexynyl, 3-heptyne, 1-octynyl, 1-nonyne, 1-decynyl, 1-undecynyl, 1-dodecynyl, and the like.

The term "alkylene" as used herein refers to a divalent group derived from a straight or branched chain saturated hydrocarbon having from 1 to 10 carbon atoms by the removal of two hydrogen atoms, for example methylene, 1,2-ethylene, 1,1-ethylene, 1,3-propylene, 2,2-dimethylpropylene, and the like. The alkylene groups of this invention can be optionally substituted. The alkylene group can also be substituted with one or more of the substituents selected from lower alkyl, lower alkoxy, lower thioalkoxy,  $-\text{O}(\text{CH}_2)_{1-5}\text{CF}_3$ , halogen, nitro, cyano,  $=\text{O}$ ,  $=\text{S}$ ,  $-\text{OH}$ ,  $-\text{SH}$ ,  $-\text{CF}_3$ ,  $-\text{CO}_2\text{H}$ ,  $-\text{CO}_2\text{C}_1\text{-C}_6$  alkyl,  $-\text{NH}_2$ ,  $-\text{NHC}_1\text{-C}_6$  alkyl,  $-\text{CONR}'\text{R}''$ , or  $-\text{N}(\text{C}_1\text{-C}_6\text{alkyl})_2$  where  $\text{R}'$  and  $\text{R}''$  are independently alkyl, alkenyl, alkynyl, aryl, or joined together to form a 4 to 7 member ring. Preferred alkylene groups have from 1 to 6 carbon atoms ( $\text{C}_1\text{-C}_6$  alkyl).

-14-

The term "cycloalkyl" means a hydrocarbon ring containing from 3 to 12 carbon atoms, for example, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclooctyl, decalanyl, norpinanyl, and adamantyl. Where possible, the cycloalkyl group may contain double bonds, for example, 3-cyclohexen-1-yl. The cycloalkyl ring may be unsubstituted or substituted by 1 to 3 substituents selected from alkyl, alkoxy, thioalkoxy, hydroxy, thiol, nitro, halogen, amino, alkyl and dialkylamino, formyl, carboxyl, CN, -NH-CO-R', -CO-NHR', -CO<sub>2</sub>R', -COR', aryl, or heteroaryl, wherein alkyl, aryl, and heteroaryl are as defined herein. Examples of substituted cycloalkyl groups include fluorocyclopropyl, 2-iodocyclobutyl, 2,3-dimethylcyclopentyl, 2,2-dimethoxycyclohexyl, and 3-phenylcyclopentyl.

The term "heteroatom" as used herein represents oxygen, nitrogen, or sulfur (O, N, or S) as well as sulfoxyl or sulfonyl (SO or SO<sub>2</sub>) unless otherwise indicated.

The term "heterocycloalkyl" means a monocyclic, fused, bridged, or spiro bicyclic heterocyclic ring systems. Monocyclic heterocyclic rings contain from about 3 to 12 ring atoms, with from 1 to 5 heteroatoms selected from N, O, and S, and preferably from 3 to 7 member atoms, in the ring. Bicyclic heterocyclics contain from 7 to 17 member atoms, preferably 7 to 12 member atoms, in the ring. Bicyclic heterocyclics contain from about 7 to about 17 ring atoms, preferably from 7 to 12 ring atoms. Bicyclic heterocyclics rings may be fused, spiro, or bridged ring systems. Examples of heterocyclic groups include cyclic ethers (oxiranes) such as ethyleneoxide, tetrahydrofuran, dioxane, and substituted cyclic ethers, wherein the substituents are those described above for the alkyl and cycloalkyl groups. Typical substituted cyclic ethers include propyleneoxide, phenyloxirane (styrene oxide), cis-2-butene-oxide (2,3-dimethyloxirane), 3-chlorotetrahydrofuran, 2,6-dimethyl-1,4-dioxane, and the like. Heterocycles containing nitrogen are groups such as pyrrolidine, piperidine, piperazine, tetrahydrotriazine, tetrahydropyrazole, and

-15-

substituted groups such as 3-aminopyrrolidine, 4-methylpiperazin-1-yl, and the like. Typical sulfur containing heterocycles include tetrahydrothiophene, dihydro-1,3-dithiol-2-yl, and hexahydrothiepin-4-yl. Other commonly employed heterocycles include dihydro-oxathiol-4-yl, tetrahydro-oxazolyl, tetrahydro-oxadiazolyl, tetrahydro-dioxazolyl, tetrahydro-oxathiazolyl, hexahydrotriazinyl, tetrahydro-oxazinyl, morpholinyl, thiomorpholinyl, tetrahydropyrimidinyl, dioxolinyl, octahydrobenzofuranyl, octahydrobenzimidazolyl, and octahydrobenzothiazolyl. For heterocycles containing sulfur, the oxidized sulfur heterocycles containing SO or SO<sub>2</sub> groups are also included. Examples include the sulfoxide and sulfone forms of tetrahydrothiophene.

The term "hydrocarbon chain" as used herein refers to a straight hydrocarbon of from 2 to 6 carbon atoms. The hydrocarbon chain is optionally substituted with one or more substituents selected from lower alkyl, lower alkoxy, lower thioalkoxy, -O(CH<sub>2</sub>)<sub>0-2</sub>CF<sub>3</sub>, halogen, nitro, cyano, =O, =S, -OH, -SH, -CF<sub>3</sub>, -CO<sub>2</sub>H, -CO<sub>2</sub>(C<sub>1</sub>-C<sub>6</sub> alkyl), -NH<sub>2</sub>, -NHC<sub>1</sub>-C<sub>6</sub> alkyl, -CONR'R", or -N(C<sub>1</sub>-C<sub>6</sub>alkyl)<sub>2</sub> where R' and R" are independently alkyl, akenyl, alkynyl, aryl, or joined together to form a 4 to 7 member ring.

The term "aryl" means a cyclic or polycyclic aromatic ring having from 5 to 12 carbon atoms, and being unsubstituted or substituted with up to 4 groups selected from C<sub>1</sub>-C<sub>6</sub> alkyl, cycloalkyl, heteroaryl, dialkylaminoalkoxy, or those recited above as substituents for alkyl. The term aryl includes both monovalent species, for example where Ar<sup>1</sup> is aryl, and divalent species, for example where Ar<sup>2</sup> is aryl. Examples of aryl groups include, but are not limited to, phenyl, biphenyl, naphthyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2-chloro-3-methylphenyl, 2-chloro-4-methylphenyl, 2-chloro-5-methylphenyl, 3-chloro-2-methylphenyl, 3-chloro-4-methylphenyl, 4-chloro-2-methylphenyl, 4-chloro-3-

-16-

methylphenyl, 5-chloro-2-methylphenyl, 2,3-dichlorophenyl, 2,5-dichlorophenyl, 3,4-dichlorophenyl, 2,3-dimethylphenyl, 3,4-dimethylphenyl, 4-trifluoromethyl and the like.

5           The term "heteroaryl" means an aromatic mono-, bi-, or polycyclic ring incorporating one or more (i.e. 1-4) heteroatoms selected from N, O, and S. The term heteroaryl includes both monovalent species, for example where Ar<sup>2</sup> is heteroaryl, and divalent species, for example where Ar<sup>1</sup> is heteroaryl. It is understood that a heterocycle is optionally substituted with up to 4 groups selected from C<sub>1</sub>-C<sub>6</sub> alkyl, 10 cycloalkyl, heteroaryl, dialkylaminoalkoxy, or those recited above as substituents for alkyl. Examples of suitable monocyclic heteroaryl include, but are not limited to substituted or unsubstituted thienyl, furanyl, pyrrolyl, imidazolyl, pyrazolyl, isothiazolyl, isoxazolyl, triazolyl, tetrazolyl, pyridinyl, pyrazinyl, pyrimidinyl, piperidinyl, pyrrolidinyl, piperazinyl, azetidiny, aziridinyl, morpholinyl, thietanyl, 15 oxetanyl. Preferred monocyclic diheterocycles include, but are not limited to 1-, 2-, 4-, or 5-imidazolyl, 1-, 3-, 4-, or 5-pyrazolyl, 3-, 4-, or 5-isothiazolyl, 3-, 4-, or 5-isoxazolyl, 1-, 3-, or 5-triazolyl, 1-, 2-, or 3-tetrazolyl, 2-pyrazinyl, 2-, 4-, or 5-pyrimidinyl, 1- or 2-piperazinyl, 2-, 3-, or 4-morpholinyl. Examples of suitable bicyclic and polycyclic heteroaryl groups include, but are not limited to include but are 20 not limited to 1-, 2-, 3-, 5-, 6-, 7-, or 8-indoliziny, 1-, 3-, 4-, 5-, 6-, or 7-isoindolyl, 2-, 3-, 4-, 5-, 6-, or 7-indolyl, 2-, 3-, 4-, 5-, 6-, or 7-indazolyl, 2-, 4-, 5-, 6-, 7-, or 8-purinyl, 1-, 2-, 3-, 4-, 6-, 7-, 8-, or 9-quinoliziny, 2-, 3-, 4-, 5-, 6-, 7-, or 8-quinoliyl, 1-, 3-, 4-, 5-, 6-, 7-, or 8-isoquinoliyl, 1-, 4-, 5-, 6-, 7-, or 8-phthalazinyl, 2-, 3-, 4-, 5-, or 6-naphthyridinyl, 2-, 3-, 5-, 6-, 7-, or 8-quinazolinyl, 3-, 4-, 5-, 6-, 7-, or 8-cinnolinyl, 2-, 4-, 6-, or 7-pteridinyl, 1-, 2-, 3-, 4-, 5-, 6-, 7-, or 8-4aH carbazolyl, 1-, 25 2-, 3-, 4-, 5-, 6-, 7-, or 8-carbzaolyl, 1-, 3-, 4-, 5-, 6-, 7-, 8-, or 9-carbolinyl, 1-, 2-, 3-, 4-, 6-, 7-, 8-, 9-, or 10-phenanthridinyl, 1-, 2-, 3-, 4-, 5-, 6-, 7-, 8-, or 9-acridinyl, 1-, 2-, 4-, 5-, 6-, 7-, 8-, or 9-perimidinyl, 2-, 3-, 4-, 5-, 6-, 8-, 9-, or 10-phenathrolinyl, 1-, 2-, 3-, 4-, 6-, 7-, 8-, or 9-phenazinyl, 1-, 2-, 3-, 4-, 6-, 7-, 8-, 9-, or 10-phenothiazinyl,

-17-

1-, 2-, 3-, 4-, 6-, 7-, 8-, 9-, or 10-phenoxazinyl, 2-, 3-, 4-, 5-, 6-, or 1-, 3-, 4-, 5-, 6-, 7-, 8-, 9-, or 10-benzisoquinolyl, 2-, 3-, 4-, or thieno[2,3-*b*]furanyl, 2-, 3-, 5-, 6-, 7-, 8-, 9-, 10-, or 11-7*H*-pyrazino[2,3-*c*]carbazolyl, 2-, 3-, 5-, 6-, or 7-2*H*-furo[3,2-*b*]pyranyl, 2-, 3-, 4-, 5-, 7-, or 8-5*H*-pyrido[2,3-*d*]-*o*-oxazinyl, 1-, 3-, or 5-1*H*-pyrazolo[4,3-*d*]-oxazolyl, 2-, 4-, or 5-4*H*-imidazo[4,5-*d*]thiazolyl, 3-, 5-, or 8-pyrazino[2,3-*d*]pyridazinyl, 2-, 3-, 5-, or 6-imidazo[2,1-*b*]thiazolyl, 1-, 3-, 6-, 7-, 8-, or 9-furo[3,4-*c*]cinnolyl, 1-, 2-, 3-, 4-, 5-, 6-, 8-, 9-, 10-, or 11-4*H*-pyrido[2,3-*c*]carbazolyl, 2-, 3-, 6-, or 7-imidazo[1,2-*b*][1,2,4]triazinyl, 7-benzo[*b*]thienyl, 2-, 4-, 5-, 6-, or 7-benzoxazolyl, 2-, 4-, 5-, 6-, or 7-benzimidazolyl, 2-, 4-, 5-, 6-, or 7-benzothiazolyl, 1-, 2-, 4-, 5-, 6-, 7-, 8-, or 9-benzoxapinyl, 2-, 4-, 5-, 6-, 7-, or 8-benzoxazinyl, 1-, 2-, 3-, 5-, 6-, 7-, 8-, 9-, 10-, or 11-1*H*-pyrrolo[1,2-*b*][2]benzazapinyl. Typical fused heteroary groups include, but are not limited to 2-, 3-, 4-, 5-, 6-, 7-, or 8-quinolyl, 1-, 3-, 4-, 5-, 6-, 7-, or 8-isoquinolyl, 2-, 3-, 4-, 5-, 6-, or 7-indolyl, 2-, 3-, 4-, 5-, 6-, or 7-benzo[*b*]thienyl, 2-, 4-, 5-, 6-, or 7-benzoxazolyl, 2-, 4-, 5-, 6-, or 7-benzimidazolyl, 2-, 4-, 5-, 6-, or 7-benzothiazolyl..


The term "hydrocarbon-heteroatom chain" as used herein refers to a hydrocarbon chain wherein one or more carbon atoms are replaced with a heteroatom. The hydrocarbon-heteroatom chain is optionally substituted with one or more substituents selected from lower alkyl, lower alkoxy, lower thioalkoxy, -O(CH<sub>2</sub>)<sub>n</sub>, -CF<sub>3</sub>, halogen, nitro, cyano, =O, =S, -OH, -SH, -CF<sub>3</sub>, -CO<sub>2</sub>H, -CO<sub>2</sub>C<sub>1</sub>-C<sub>6</sub> alkyl, -NH<sub>2</sub>, -NHC<sub>1</sub>-C<sub>6</sub> alkyl, -CONR'R'', or -N(C<sub>1</sub>-C<sub>6</sub>alkyl)<sub>2</sub> where R' and R'' are independently alkyl, akenyl, alkynyl, aryl, or joined together to form a 4 to 7 member ring.

The term "heteroalkylene" as used herein, refers to an alkylene radical as defined above that includes one or more heteroatoms such as oxygen, sulfur, or nitrogen (with valence completed by hydrogen or oxygen) in the carbon chain or terminating the carbon chain.

-18-

The terms "lower alkoxy" and "lower thioalkoxy" as used herein refers to O-alkyl or S-alkyl of from 1 to 6 carbon atoms as defined above for "lower alkyl."

5           The term "cycloalkenyl" means a cycloalkyl group having one or more carbon-carbon double. Example includes cyclobutene, cyclopentene, cyclohexene, cycloheptene, cyclobutadiene, cyclopentadiene, and the like.

10           The symbol " " means a bond to a group wherein a 4 to 8 membered ring is formed. Typically this symbol will appear in pairs.

15           When a bond is represented by a line such as "---" this is meant to represent that the bond may be absent or present provided that the resultant compound is stable and of satisfactory valency.

          The term "patient" means all mammals including humans. Examples of patients include humans, cows, dogs, cats, goats, sheep, pigs, and rabbits.

20           A "therapeutically effective amount" is an amount of a compound of the present invention that when administered to a patient ameliorates a symptom of dyslipidemia, non-insulin dependent diabetes mellitus, obesity, hyperglycemia, hypercholesteremia, hyperlipidemia, atherosclerosis, hypertriglyceridemia, hyperinsulinemia, glucose disorders associated with circulating glucocorticoids, growth hormone, catecholamines, glucagon, or parathyroid hormone. Additionally, a  
25           "therapeutically effective amount" is an amount of a compound of the present invention that when administered to a patient ameliorates a symptom of an eating disorder, suppresses appetite, or modulates leptin levels.

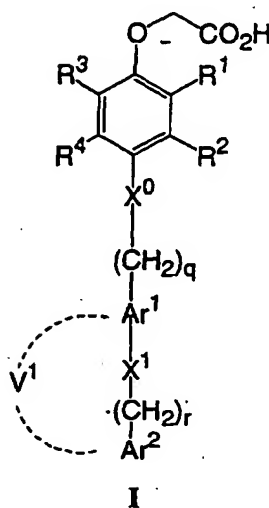
-19-

The term "a pharmaceutically acceptable salt" refers to the relatively non-toxic, inorganic and organic base or acid addition salts of compounds of the present invention. These salts can be prepared in situ during the final isolation and purification of the compounds or by separately reacting the purified compound in its free form with a suitable organic or inorganic base or acid and isolating the salt thus formed. Representative salts include the hydrobromide, hydrochloride, sulfate, bisulfate, nitrate, acetate, oxalate, valerate, oleate, palmitate, stearate, laurate, borate, benzoate, lactate, phosphate, tosylate, citrate, maleate, fumarate, succinate, tartrate, naphthylate mesylate, glucoheptonate, lactobionate, and laurylsulphonate salts, and the like. These also include cations based on the alkali and alkaline earth metals, such as sodium, lithium, potassium, calcium, magnesium, and the like, as well as non-toxic ammonium, quaternary ammonium, and amine cations including, but not limited to ammonium, tetramethylammonium, tetraethylammonium, methylamine, dimethylamine, trimethylamine, triethylamine, ethylamine, and the like. (See, for example, Berge S.M., et al., "Pharmaceutical Salts," *J. Pharm. Sci.*, 1977;66:1-19, which is incorporated herein by reference.) The free base form may be regenerated by contacting the salt form with a base. While the free base may differ from the salt form in terms of physical properties, such as solubility, the salts are equivalent to their respective free bases for the purposes of the present invention.



-20-

Compounds of the present invention are described by Formula I:

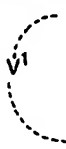





5

and pharmaceutically acceptable salts thereof, where:

$X^0$  and  $X^1$  are independently absent, O, S,  $-\text{CH}_2-$ ,  $-\text{CH}_2\text{CH}_2-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{CH}\equiv\text{CH}-$ ,  $-\text{S}(\text{O})_2-$ , or  $-\text{S}(\text{O})-$ ;

10  $\text{Ar}^1$  and  $\text{Ar}^2$  are each independently unsubstituted or substituted aryl or heteroaryl, provided that  $\text{Ar}^1$  is not thiazolyl or oxazolyl;

 is absent; or when present,  is a saturated or unsaturated hydrocarbon chain which is substituted or unsubstituted, wherein said chain has from

 1 to 4 atoms so that ,  $\text{Ar}^1$ ,  $X^1$ ,  $(\text{CH}_2)_r$ , and  $\text{Ar}^2$ , together form a five to eight membered ring;

15

-21-

$R^1$  and  $R^2$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl, -O-(CH<sub>2</sub>)<sub>m</sub>CF<sub>3</sub>, halogen, nitro, cyano, -OH, -SH, -CF<sub>3</sub>, -S(O)<sub>p</sub>alkyl, S(O)<sub>p</sub>aryl, - (CH<sub>2</sub>)<sub>m</sub>OR<sup>5</sup>, -(CH<sub>2</sub>)<sub>m</sub>NR<sup>6</sup>R<sup>7</sup>, -COR<sup>5</sup>, -CO<sub>2</sub>R<sup>5</sup>, or -NR<sup>6</sup>R<sup>7</sup>, or together with the atoms to which they are attached form a five to eight member ring;

5         $R^3$  and  $R^4$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl, -O-(CH<sub>2</sub>)<sub>m</sub>CF<sub>3</sub>, halogen, nitro, cyano, -OH, -SH, -CF<sub>3</sub>, -S(O)<sub>p</sub>alkyl, S(O)<sub>p</sub>aryl, - (CH<sub>2</sub>)<sub>m</sub>OR<sup>5</sup>, -(CH<sub>2</sub>)<sub>m</sub>NR<sup>6</sup>R<sup>7</sup>, -COR<sup>5</sup>, -CO<sub>2</sub>H, -CO<sub>2</sub>R<sup>5</sup>, or -NR<sup>6</sup>R<sup>7</sup>;

provided that at least one of  $R_1$ - $R_4$  is H, lower alkyl, lower alkoxy, haloalkyl, -O-(CH<sub>2</sub>)<sub>m</sub>CF<sub>3</sub>, halogen, nitro, cyano, -OH, -SH, -CF<sub>3</sub>, -S(O)<sub>p</sub>alkyl, S(O)<sub>p</sub>aryl, - (CH<sub>2</sub>)<sub>m</sub>OR<sup>5</sup>, -(CH<sub>2</sub>)<sub>m</sub>NR<sup>6</sup>R<sup>7</sup>, or NR<sup>6</sup>R<sup>7</sup>;

10

$R^5$  is hydrogen, alkyl, alkenyl, alkynyl, or aryl;

$R^6$  and  $R^7$  are each independently hydrogen, alkyl, alkenyl, alkynyl, -COalkyl, -COaryl, cycloalkyl, -CO<sub>2</sub>alkyl, -CO<sub>2</sub>aryl, or  $R^6$  and  $R^7$  together with the atoms to which they are attached form a 4 to 7 membered ring having 1 to 3 heteroatoms;

15         $m$  is 0 to 5;

$p$  is 0, 1, or 2;

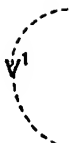
$q$  is 0 to 6; and


$r$  is 0 to 6.

20        In compounds of Formula I,  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^4$  are preferably selected from hydrogen, alkyl, or alkoxy. More preferably,  $R^2$  and  $R^3$  are hydrogen; and  $R^1$  and  $R^4$  are alkyl or alkoxy. In a particularly preferred embodiment of Formula I,  $R^2$  and  $R^3$  are hydrogen;  $R^1$  is alkyl; and  $R^4$  is alkoxy. Preferred alkoxy include methoxy, ethoxy, isopropoxy, n-propoxy, t-butoxy, n-butoxy, or isobutoxy. Similarly,

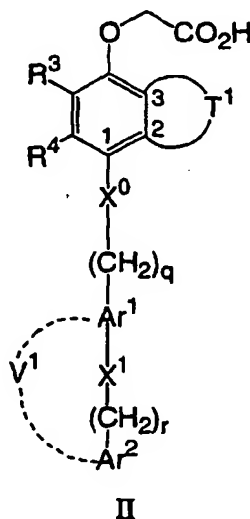
25        preferred alkyl include methyl, ethyl, isopropyl, n-propyl, t-butyl, n-butyl, or isobutyl. In a most preferred embodiment of Formula I,  $q$  is 1,  $Ar^1$  is phenyl,  $X^1$  is absent,  $r$  is 0,  $V^1$  is absent, and  $Ar^2$  is 4-trifluoromethylphenyl.

-22-

In compounds of Formula I,  is preferably  $(CH_2)_t$ , wherein t is 1 to 4.

Additionally,  is optionally substituted with at least one substituent, wherein the substituent include but are not limited to lower alkyl, lower alkoxy, lower thioalkoxy,  $-O(CH_2)_{0-2}CF_3$ , halogen, nitro, cyano,  $=O$ ,  $=S$ ,  $-OH$ ,  $-SH$ ,  $-CF_3$ ,  $-OCF_3$ ,  $-CO_2H$ ,  $-CO_2C_1-C_6$  alkyl,  $-NH_2$ ,  $-NHC_1-C_6$  alkyl,  $-CONR'R''$ , or  $-N(C_1-C_6\text{alkyl})_2$  where  $R'$  and  $R''$  are independently alkyl, akenyl, alkynyl, aryl, or joined together to form a 4 to 7 member ring.

In a preferred embodiment of Formula I,  $R^1$  and  $R^2$  are joined together to form a five to eight member ring having Formula II. Such a ring includes, for example, cycloalkyl, aryl, heterocycloalkyl, or a heteroaryl rings where each such ring is optionally substituted as described above.

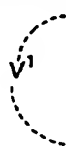


and pharmaceutically acceptable salts thereof, where:

-23-

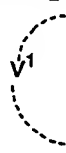
$X^0$  and  $X^1$  are independently absent, O, S,  $-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{CH}\equiv\text{CH}-$ ,  $-\text{S}(\text{O})_2-$ , or  $-\text{S}(\text{O})-$ ;

$\text{Ar}^1$  and  $\text{Ar}^2$  are each independently unsubstituted or substituted aryl or heteroaryl, provided that  $\text{Ar}^1$  is not thiazolyl or oxazolyl;



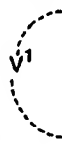
5

is absent; or when present,



is a saturated or unsaturated

hydrocarbon chain which is substituted or unsubstituted, wherein said chain has from



1 to 4 atoms so that ,  $\text{Ar}^1$ ,  $X^1$ ,  $(\text{CH}_2)_r$ , and  $\text{Ar}^2$ , together form a five to eight member ring;

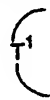
10

$\text{R}^3$  and  $\text{R}^4$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $\text{O}-(\text{CH}_2)_m\text{CF}_3$ , halogen, nitro, cyano,  $-\text{OH}$ ,  $-\text{SH}$ ,  $-\text{CF}_3$ ,  $-\text{S}(\text{O})_p\text{alkyl}$ ,  $\text{S}(\text{O})_p\text{aryl}$ ,  $-(\text{CH}_2)_m\text{OR}^5$ ,  $-(\text{CH}_2)_m\text{NR}^6\text{R}^7$ ,  $-\text{COR}^5$ ,  $-\text{CO}_2\text{H}$ ,  $-\text{CO}_2\text{R}^5$ , or  $-\text{NR}^6\text{R}^7$ ;

$\text{R}^5$  is hydrogen, alkyl, alkenyl, alkynyl, or aryl;

15

$\text{R}^6$  and  $\text{R}^7$  are each independently hydrogen, alkyl, alkenyl, alkynyl,  $-\text{COalkyl}$ ,  $-\text{COaryl}$ , cycloalkyl,  $-\text{CO}_2\text{alkyl}$ ,  $-\text{CO}_2\text{aryl}$ ,  $-\text{SO}_2\text{alkyl}$ ,  $-\text{SO}_2\text{aryl}$ , or  $\text{R}^6$  and  $\text{R}^7$  together with the atoms to which they are attached form a 4 to 7 membered ring having 1 to 3 heteroatoms;



is a saturated or unsaturated, substituted or unsubstituted hydrocarbon chain or hydrocarbon-heteroatom chain having from 3 to 6 atoms wherein the carbon atom of position 2 is connected to the carbon atom of position 3 to form a five to eight member ring;

20

-24-

m is 0 to 5;

p is 0 to 2;

q is 0 to 6; and

r is 0 to 6.

5

10

15

Preferably,  $\left( \begin{array}{c} \text{ } \\ \text{ } \\ \text{ } \end{array} \right)^1$  is -CH<sub>2</sub>CH<sub>2</sub>CO-O-, -CH<sub>2</sub>-CH<sub>2</sub>-O-CO-, -CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-,  
 -HC=CH-HC=CH-, -N=CH-HC=CH-, -HC=N-HC=CH-, -HC=CH-N=CH-, -  
 HC=CH-HC=N-, -CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-O-CH<sub>2</sub>-, -CH<sub>2</sub>-O-CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-  
 HC=CH-CH<sub>2</sub>-, -CH<sub>2</sub>-HC=CH-, -CH<sub>2</sub>CH<sub>2</sub>-NR<sup>4</sup>-CH<sub>2</sub>-, -COCH=CH-O-, -O-CH=CH-  
 CO-, -CH=CH-NR<sup>4</sup>-, -NR<sup>4</sup>-CH=CH-, -CH=CH-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-NR<sup>4</sup>-, -NR<sup>4</sup>-CH<sub>2</sub>-  
 CH<sub>2</sub>-, -O-CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-O-, -CH<sub>2</sub>-CH<sub>2</sub>CO-, -CH<sub>2</sub>CO-CH<sub>2</sub>-, -CO-CH<sub>2</sub>-CH<sub>2</sub>-,  
 -CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>CO-, -CO-CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>CO-CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>CO-CH<sub>2</sub>-,  
 -CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-NR<sup>4</sup>-, -NR<sup>4</sup>-CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-, -O-CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>2</sub>-O-,  
 -CO-NR<sup>4</sup>-CH<sub>2</sub>-CH<sub>2</sub>-, NR<sup>4</sup>CO-CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-NR<sup>4</sup>-CO-, or -CH<sub>2</sub>-CH<sub>2</sub>-CO-  
 NR<sup>4</sup>-. It will be understood that the left-most atom of these groups is attached to the  
 atom labeled "3" in Formula I and the right-most atom of these groups is attached to  
 the atom label "2" in Formula I.

20

In the present embodiment,  $\left( \begin{array}{c} \text{ } \\ \text{ } \\ \text{ } \end{array} \right)^1$  is optionally substituted with 1 or more  
 substituents selected from the group consisting of lower alkyl, lower alkoxy, lower  
 thioalkoxy, -O(CH<sub>2</sub>)<sub>1-5</sub>CF<sub>3</sub>, halogen, nitro, cyano, =O, =S, -OH, -SH, -CF<sub>3</sub>, -CO<sub>2</sub>H,  
 -CO<sub>2</sub>C<sub>1</sub>-C<sub>6</sub> alkyl, -NH<sub>2</sub>, -NHC<sub>1</sub>-C<sub>6</sub> alkyl, -OCH<sub>2</sub>O-, and -N(C<sub>1</sub>-C<sub>6</sub>alkyl)<sub>2</sub>.


In compounds of Formula II, R<sup>3</sup>, and R<sup>4</sup> are preferably selected from


25

hydrogen, alkyl, or alkoxy. More preferably, R<sup>3</sup> and R<sup>4</sup> are hydrogen; and  $\left( \begin{array}{c} \text{ } \\ \text{ } \\ \text{ } \end{array} \right)^1$  is a

-25-

saturated or unsaturated, unsubstituted hydrocarbon chain having from 3 to 6 atoms wherein the carbon atom of position 2 is connected to the carbon atom of position 3 to form a five to eight member ring such as a cyclopentyl or cyclohexyl ring. In a most preferred embodiment of Formula II, q is 1, Ar<sup>1</sup> is phenyl, X<sup>1</sup> is O, r is 1, V<sup>1</sup> is absent, and Ar<sup>2</sup> is 4-trifluoromethylphenyl.

Also in this embodiment,  is preferably (CH<sub>2</sub>)<sub>t</sub>, wherein t is 1 to 4.

Additionally,  is optionally substituted with at least one substituent, wherein the substituent include but are not limited to lower alkyl, lower alkoxy, lower thioalkoxy, -O(CH<sub>2</sub>)<sub>0-2</sub>CF<sub>3</sub>, halogen, nitro, cyano, =O, =S, -OH, -SH, -CF<sub>3</sub>, -OCF<sub>3</sub>, -CO<sub>2</sub>H, -CO<sub>2</sub>C<sub>1</sub>-C<sub>6</sub> alkyl, -NH<sub>2</sub>, -NHC<sub>1</sub>-C<sub>6</sub> alkyl, -CONR'R'', or -N(C<sub>1</sub>-C<sub>6</sub>alkyl)<sub>2</sub> where R' and R'' are independently alkyl, akenyl, alkynyl, aryl, or joined together to form a 4 to 7 member ring.

Examples of compounds of Formula I and Formula II include

[4-(Biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid;

[4-(Biphenyl-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid;

[2-Methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

[5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

[5-Methoxy-2-methyl-4-(2',4',6'-trimethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

-26-

- [4-(4'-Chloro-3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid;
- 5 [4-(2',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid;
- [4-(3',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid;
- 10 [5-Methoxy-2-methyl-4-(3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;
- [4-(4'-Fluoro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid;
- 15 [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;
- [7-(4'-Trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid;
- 20 acid;
- [4-(4-Benzyloxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid;
- [5-Methoxy-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy]-acetic acid;
- 25 [2-Methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy]-acetic acid;
- [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid;
- 30 [4-(9H-Fluoren-2-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid;
- [5-Methoxy-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy]-acetic acid;
- 35 [5-Methoxy-2-methyl-4-[6-(4-trifluoromethyl-phenyl)-pyridin-3-ylmethylsulfanyl]-phenoxy]-acetic acid;
- 40 [5-Chloro-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

-27-

[3-Methoxy-4-(4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-phenoxy]-acetic acid;

5 {2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid;

{5-Methoxy-2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid;

10 {2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-vinyl]-phenoxy}-acetic acid;

{2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethyl]-phenoxy}-acetic acid;

15 {7-[4-(5-Trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

20 {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

{5-Methyl-7-(4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl)-indan-4-yloxy}-acetic acid;

25 (4-[4-[2-(3-Fluoro-phenyl)-vinyl]-benzylsulfanyl]-5-methoxy-2-methyl-phenoxy)-acetic acid;

{2-Methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid;

30 {4-[4-(2,4-Difluoro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid;

35 {4-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid;

{4-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid;

40 {4-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid;

{2-Methyl-4-[4-(4-trifluoromethoxy-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid;



{6-Methyl-8-[4-(5-trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid;

5 {5-Chloro-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid;

{5-hydroxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy}-acetic acid;

10

{5-Methoxy-2-methyl-4-(3-methyl-4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy}-acetic acid;

15

{7-[4-(4-trifluoromethyl-benzyl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

{4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-5-methoxy-2-methyl-phenoxy}-acetic acid;

20

{2-Methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid;

{5-Methoxy-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid;

25

{7-[5-(4-Trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid;

{2-Methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid;

30

{5-Methoxy-2-methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid;

{2-Methyl-4-(4-phenoxy-benzylsulfanyl)-phenoxy}-acetic acid;

35

{7-(4'-Trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-indan-4-yloxy}-acetic acid;

40

{5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-phenoxy}-acetic acid;

{5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfonyl)-phenoxy}-acetic acid;

-29-

[5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfinyl)-phenoxy]-acetic acid;

5        [2-Propyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

      (7-[3-(5-Trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy)-acetic acid;

10        (5-Methoxy-2-methyl-4-{2-[1-(4-trifluoromethyl-benzyl)-1H-indol-3-yl]-ethylsulfanyl}-phenoxy)-acetic acid;

      [7-(4'-Trifluoromethyl-biphenyl-2-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid;

15        {5-Methoxy-2-methyl-4-[2-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid;

      {4-[4-(4-Fluoro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid;

20        {4-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid;

      4-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid;

25        {2-Methyl-4-[4-(pyridine-2-ylmethoxy)-benzylsulfanyl]-phenoxy}-acetic acid;

30        {5-Chloro-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid;

      {7-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

35        {7-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

      {5-Methyl-7-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

40        {7-[4-(4-Fluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

      {7-[4-(2,4-Difluoro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

-30-

- {7-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 5 {7-(4-Benzyloxy-benzylsulfanyl)-indan-4-yloxy}-acetic acid;
- {7-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 10 {7-[4-(3,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[4-(4-Chloro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 15 {7-[4-(4-Fluoro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[4-(4-Trifluoromethoxy-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 20 acid;
- {7-[4-(4-Fluoro-2-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[4-(3,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 25 {7-[4-Methoxy-3-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 30 acid;
- {7-[3-(4-Chloro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 35 {7-[2-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[3,5-Dichloro-4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;
- 40 {8-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid;

-31-

- {8-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid;
- 5 {8-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid;
- {8-[4-(5-Trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid;
- 10 {7-[5-(2-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[3-(2,6-Dichloro-phenyl)-5-methyl-isoxazol-4-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid;
- 15 {7-[3-(4-Trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-indan-4-yloxy}-acetic acid;
- 20 {7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethyl]-indan-4-yloxy}-acetic acid;
- {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-2,3-dihydro-benzofuran-4-yloxy}-acetic acid;
- 25 {8-(4'-Trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-chroman-5-yloxy}-acetic acid;
- {8-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-chroman-5-yloxy}-acetic acid;
- 30 {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid;
- 35 {7-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid;
- {7-[3-(4-Chloro-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid;
- 40 {5-Chloro-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid;

-32-

- 2-[2-butyl-4-((4-[4-(trifluoromethyl)phenyl]phenyl)methylthio)phenoxy]acetic acid;
- 5 {6-methyl-8-[4-(4-trifluoromethyl-benzyloxy)-benzyl-sulfanyl]-chroman-5-yloxy}-acetic acid;
- {4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-5,6,7,8-tetrahydro-naphthalen-1-yloxy}-acetic acid;
- 10 (4-{2-Butyl-5-chloro-1-[4-(1-cyano-cyclopentyl)-benzyl]-1H-imidazol-4-ylmethylsulfanyl}-2-methyl-phenoxy)-acetic acid;
- {4-(5-Biphenyl-4-yl-2-thiophen-2-yl-4,5-dihydro-oxazol-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy}-acetic acid;
- 15 {4-[2-(4-Bromo-phenoxy)-ethylsulfanyl]-2,6-dimethyl-phenoxy}-acetic acid;
- {4-(3-{2-[4-(2-Diethylamino-ethoxy)-phenyl]-benzimidazol-1-yl}-propylsulfanyl)-5-methoxy-2-methyl-phenoxy}-acetic acid;
- 20 {4-(5-Biphenyl-4-yl-2-thiophen-2-yl-4,5-dihydro-oxazol-4-ylmethylsulfanyl)-2-methyl-phenoxy}-acetic acid;
- (4-{2-[3-(4-Fluoro-phenyl)-benzo[b]thiophen-7-yl]-ethylsulfanyl}-2-methyl-phenoxy)-acetic acid;
- 25 {2-Methyl-4-[2-(5-phenyl-naphthalen-1-yloxy)-ethylsulfanyl]-phenoxy}-acetic acid;
- [2-Methyl-4-(3-phenoxy-benzylsulfanyl)-phenoxy]-acetic acid;
- 30 [2,5-Dimethyl-4-(5-p-tolyl-1,3,4-oxadiazol-2-ylmethylsulfanyl)-phenoxy]-acetic acid;
- [2-Methyl-4-(4-pyrazol-1-yl-benzylsulfanyl)-phenoxy]-acetic acid;
- 35 [2-Methyl-4-(5-methyl-3-phenyl-isoxazol-4-ylmethylsulfanyl)-phenoxy]-acetic acid;
- [4-(Biphenyl-2-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid;
- 40 {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid;

-33-

[2-Methyl-4-(5-p-tolyl-1,3,4-oxadiazol-2-ylmethylsulfanyl)-phenoxy]-acetic acid;

5 {4-[3-(4-Chloro-phenyl)-1,2,4-oxadiazol-5-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid;

[2,5-Dimethyl-4-(4-pyrazol-1-yl-benzylsulfanyl)-phenoxy]-acetic acid;

10 [4-(Biphenyl-2-ylmethylsulfanyl)-2,5-dimethyl-phenoxy]-acetic acid;

[4-(4-Benzyloxy-benzylsulfanyl)-5,6,7,8-tetrahydro-naphthalen-1-yloxy]-acetic acid;

15 [4-(4-Benzyloxy-benzylsulfanyl)-2,6-dimethyl-phenoxy]-acetic acid;

[4-(4-Benzyloxy-benzylsulfanyl)-2,5-dimethyl-phenoxy]-acetic acid;

[4-(4-Benzyloxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid;

20 [4-(4-Benzyloxy-benzylsulfanyl)-phenoxy]-acetic acid;

[4-(Biphenyl-4-ylmethylsulfanyl)-5,6,7,8-tetrahydro-naphthalen-1-yloxy]-acetic acid;

25 [4-(Biphenyl-4-ylmethylsulfanyl)-2,6-dimethyl-phenoxy]-acetic acid;

[4-(Biphenyl-4-ylmethylsulfanyl)-2,5-dimethyl-phenoxy]-acetic acid;

30 [4-(Biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

{4-[3-(2-Fluoro-phenoxy)-benzylsulfanyl]-2,6-dimethyl-phenoxy}-acetic acid;

35 [4-(2-{4-[2-(3-Chloro-4-cyclohexyl-phenyl)-ethyl]-piperazin-1-yl}-ethylsulfanyl)-2-methyl-phenoxy]-acetic acid;

[5-Methoxy-2-methyl-4-(2-{4-[2-(3-phenyl-benzofuran-7-yl)-ethyl]-piperazin-1-yl}-ethylsulfanyl)-phenoxy]-acetic acid;

40 [4-[2-(2,6-Diphenyl-piperidin-1-yl)-ethylsulfanyl]-5-methoxy-2-methyl-phenoxy]-acetic acid;

[2-Methyl-4-(2-{4-[2-(3-phenyl-benzofuran-7-yl)-ethyl]-piperazin-1-yl}-ethylsulfanyl)-phenoxy]-acetic acid;

-34-

[4-[2-(2,6-Diphenyl-piperidin-1-yl)-ethylsulfanyl]-2-methyl-phenoxy]-acetic acid;  
and pharmaceutically acceptable salts thereof.

5

A subset of exemplary compounds of Formula I and Formula II include  
[4-(Biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid;  
[5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-  
phenoxy]-acetic acid;

10

[4-(2',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-  
phenoxy]-acetic acid;

[5-Methoxy-2-methyl-4-(3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-  
phenoxy]-acetic acid;

15

[4-(4'-Fluoro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-  
acetic acid;

[7-(4'-Trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic  
acid;

[5-Methoxy-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-  
phenoxy]-acetic acid;

20

[5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-3-ylmethylsulfanyl)-  
phenoxy]-acetic acid;

[5-Methoxy-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-  
phenoxy]-acetic acid;

25

[5-Methoxy-2-methyl-4-[6-(4-trifluoromethyl-phenyl)-pyridin-3-  
ylmethylsulfanyl]-phenoxy]-acetic acid;

[3-Methoxy-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-  
acetic acid;

[5-Methoxy-2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-  
phenoxy]-acetic acid;

-35-

(4-{4-[2-(3-Fluoro-phenyl)-vinyl]-benzylsulfanyl}-5-methoxy-2-methyl-phenoxy)-acetic acid;

{5-Methoxy-2-methyl-4-(3-methyl-4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy}-acetic acid;

5 {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-5-methoxy-2-methyl-phenoxy}-acetic acid;

{5-Methoxy-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid;

10 {5-Methoxy-2-methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid;

{5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-phenoxy}-acetic acid;

{7-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid;

15 {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-2,3-dihydro-benzofuran-4-yloxy}-acetic acid;

and pharmaceutically acceptable salts thereof.

20 Certain of the compounds of the present invention possess one or more chiral centers and each center may exist in the R or S configuration. The present invention includes all diastereomeric, enantiomeric, and epimeric forms as well as the appropriate mixtures thereof. Stereoisomers may be obtained, if desired, by methods known in the art as, for example, the separation of stereoisomers by chiral chromatographic columns. Additionally, the compounds of the present invention may  
25 exist as geometric isomers. The present invention includes all cis, trans, syn, anti, entgegen (E), and zusammen (Z) isomers as well as the appropriate mixtures thereof.

In some situations, compounds may exist as tautomers. All tautomers are included within Formulas I and II and are provided by this invention.



-36-

In addition, the compounds of the present invention can exist in unsolvated as well as solvated forms with pharmaceutically acceptable solvents such as water, ethanol, and the like. In general, the solvated forms are considered equivalent to the unsolvated forms for the purposes of the present invention.

The present invention includes all pharmaceutically acceptable, nonn-toxic esters of the compounds of Formulae I and II. Such esters include C<sub>1</sub>-C<sub>6</sub> alkyl esters where the alkyl group is a straight or branched chain. Acceptable esters also include C<sub>5</sub>-C<sub>7</sub> cycloalkyl esters as well as arylalkyl esters such as, but not limited to benzyl. C<sub>1</sub>-C<sub>4</sub> esters are preferred. Esters of the compounds of the present invention may be prepared according to conventional methods.

The compounds of the present invention are suitable to be administered to a patient for the treatment, control, or prevention of hypercholesteremia, dyslipidemia, obesity, hyperglycemia, hypercholesteremia, atherosclerosis, hypertriglyceridemia, and hyperinsulinemia. The compounds of the present invention are also suitable to be administered to a patient for the suppression of appetite and modulation of leptin. Accordingly, the compounds may be administered to a patient alone or as part of a composition that contains other components such as excipients, diluents, and carriers, all of which are well-known in the art. The compositions can be administered to humans and/or animals either orally, rectally, parenterally (intravenously, intramuscularly, or subcutaneously), intracisternally, intravaginally, intraperitoneally, intravesically, locally (powders, ointments, or drops), or as a buccal or nasal spray.

Compositions suitable for parenteral injection may comprise physiologically acceptable sterile aqueous or nonaqueous solutions, dispersions, suspensions or emulsions, and sterile powders for reconstitution into sterile injectable solutions or dispersions. Examples of suitable aqueous and nonaqueous carriers, diluents, solvents

-37-

or vehicles include water, ethanol, polyols (propyleneglycol, polyethyleneglycol, glycerol, and the like), suitable mixtures thereof, vegetable oils (such as olive oil), and injectable organic esters such as ethyl oleate. Proper fluidity can be maintained, for example, by the use of a coating such as lecithin, by the maintenance of the required particle size in the case of dispersions and by the use of surfactants.

These compositions may also contain adjuvants such as preserving, wetting, emulsifying, and dispensing agents. Prevention of the action of microorganisms can be ensured by various antibacterial and antifungal agents, for example, parabens, chlorobutanol, phenol, sorbic acid, and the like. It may also be desirable to include isotonic agents, for example sugars, sodium chloride, and the like. Prolonged absorption of the injectable pharmaceutical form can be brought about by the use of agents delaying absorption, for example, aluminum monostearate and gelatin.

Solid dosage forms for oral administration include capsules, tablets, pills, powders, and granules. In such solid dosage forms, the active compound is admixed with at least one inert customary excipient (or carrier) such as sodium citrate or dicalcium phosphate or (a) fillers or extenders, as for example, starches, lactose, sucrose, glucose, mannitol, and silicic acid; (b) binders, as for example, carboxymethylcellulose, alginates, gelatin, polyvinylpyrrolidone, sucrose, and acacia; (c) humectants, as for example, glycerol; (d) disintegrating agents, as for example, agar, calcium carbonate, potato or tapioca starch, alginic acid, certain complex silicates, and sodium carbonate; (e) solution retarders, as for example paraffin; (f) absorption accelerators, as for example, quaternary ammonium compounds; (g) wetting agents, as for example, cetyl alcohol and glycerol monostearate; (h) adsorbents, as for example, kaolin and bentonite; and (i) lubricants, as for example, talc, calcium stearate, magnesium stearate, solid polyethylene glycols, sodium lauryl sulfate, or mixtures thereof. In the case of capsules, tablets, and pills, the dosage forms may also comprise buffering agents.

-38-

Solid compositions of a similar type may also be employed as fillers in soft and hard-filled gelatin capsules using such excipients as lactose or milk sugar, as well as high molecular weight polyethyleneglycols, and the like.

5

Solid dosage forms such as tablets, dragees, capsules, pills, and granules can be prepared with coatings and shells, such as enteric coatings and others well-known in the art. They may contain opacifying agents, and can also be of such composition that they release the active compound or compounds in a certain part of the intestinal tract in a delayed manner. Examples of embedding compositions which can be used are polymeric substances and waxes. The active compounds can also be in micro-encapsulated form, if appropriate, with one or more of the above-mentioned excipients.

15

Liquid dosage forms for oral administration include pharmaceutically acceptable emulsions, solutions, suspensions, syrups, and elixirs. In addition to the active compounds, the liquid dosage forms may contain inert diluents commonly used in the art, such as water or other solvents, solubilizing agents and emulsifiers, as for example, ethyl alcohol, isopropyl alcohol, ethyl carbonate, ethyl acetate, benzyl alcohol, benzyl benzoate, propyleneglycol, 1,3-butyleneglycol, dimethylformamide, oils, in particular, cottonseed oil, groundnut oil, corn germ oil, olive oil, castor oil and sesame oil, glycerol, tetrahydrofurfuryl alcohol, polyethyleneglycols and fatty acid esters of sorbitan or mixtures of these substances, and the like.

20

25

Besides such inert diluents, the composition can also include adjuvants, such as wetting agents, emulsifying and suspending agents, sweetening, flavoring, and perfuming agents.

-39-

Suspensions, in addition to the active compounds, may contain suspending agents, as for example, ethoxylated isostearyl alcohols, polyoxyethylene sorbitol and sorbitan esters, microcrystalline cellulose, aluminum metahydroxide, bentonite, agar-agar and tragacanth, or mixtures of these substances, and the like.

5

Compositions for rectal administrations are preferably suppositories which can be prepared by mixing the compounds of the present invention with suitable non-irritating excipients or carriers such as cocoa butter, polyethyleneglycol, or a suppository wax, which are solid at ordinary temperatures but liquid at body temperature and therefore, melt in the rectum or vaginal cavity and release the active component.

10

Dosage forms for topical administration of a compound of this invention include ointments, powders, sprays, and inhalants. The active component is admixed under sterile conditions with a physiologically acceptable carrier and any

15

preservatives, buffers, or propellants as may be required. Ophthalmic formulations, eye ointments, powders, and solutions are also contemplated as being within the scope of this invention.

20

The compounds of the present invention can be administered to a patient at dosage levels in the range of about 0.1 to about 2,000 mg per day. For a normal human adult having a body weight of about 70 kilograms, a dosage in the range of about 0.01 to about 10 mg per kilogram of body weight per day is preferable. However, the specific dosage used can vary. For example, the dosage can depend on a numbers of factors including the requirements of the patient, the severity of the condition being treated, and the pharmacological activity of the compound being used. The determination of optimum dosages for a particular patient is well-known to those skilled in the art.

25

-40-

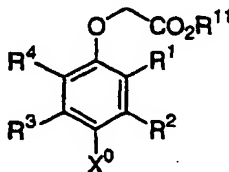
## PREPARATION OF COMPOUNDS OF THE INVENTION

The present invention contains compounds that can be synthesized in a number of ways familiar to one skilled in organic synthesis. The compounds outlined herein can be synthesized according to the methods described below, along with

5 methods typically utilized by a synthetic chemist, and combinations or variations of those methods, which are generally known to one skilled in the art of synthetic chemistry. The synthetic route of compounds in the present invention is not limited to the methods outlined below. It is assumed one skilled in the art will be able to use the schemes outlined below to synthesize compounds claimed in this invention.

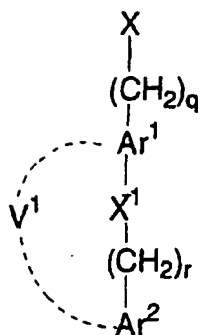
10 Individual compounds may require manipulation of the conditions in order to accommodate various functional groups. A variety of protecting groups generally known to one skilled in the art may be required. Purification, if necessary, can be accomplished on a silica gel column eluted with the appropriate organic solvent system. Also, reverse phase HPLC or recrystallization may be employed.

15 Many of the compounds with Formulas I and II are preferably made by reacting:



20 in a solvent in the presence of a base such as cesium carbonate, with the aryl halide:

-41-



wherein:

- 5         $n, R^1, R^2, R^3, R^4, X^0, X^1, V^1, Ar^1$ , and  $Ar^2$  are the same as defined above for Formula I;
- $R^{11}$  is a lower alkyl; and
- $X$  is a halogen.

10        The resulting ester is then preferably hydrolyzed to form the compounds of Formulas I and II. Specifically, compounds of Formulas I and II can be prepared using the synthetic route outlined in Scheme 1-6.

Scheme 1 covers the preparation of compounds of Formulas I and II wherein

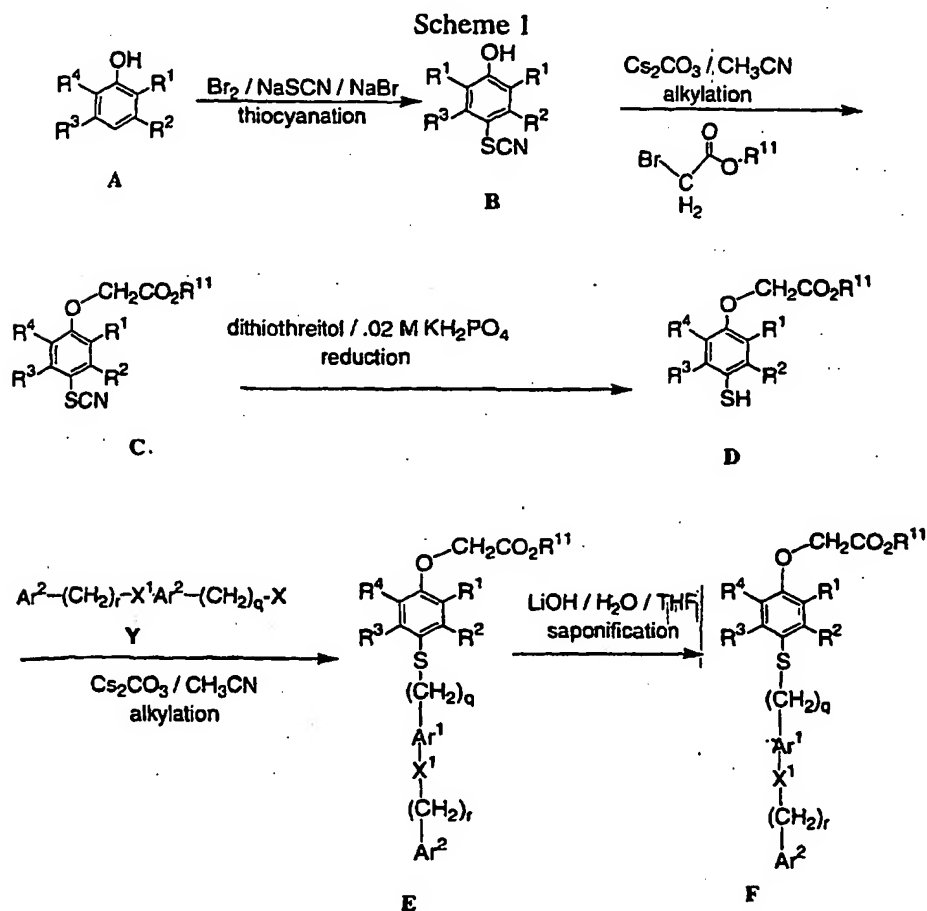


- 15         $X^0$  is S,  $q$  is 0-3, is absent,  $X^1$  is absent and  $r$  is 0. Compounds of the general formula A are thiocyanated with a mixture of bromine and sodium thiocyanate to give compounds of the general formula B. Compounds of the general formula B are then alkylated with an alkyl haloacrylate to give compounds of the general formula C. The preferred alkyl haloacrylate is methyl bromoacetate. Alternate routes to compounds of formula C will be readily apparent to a person skilled in the art of organic synthesis. Compounds of the general formula D are then prepared by reduction of C with dithiothreitol in methanol. Compounds of the
- 20

-42-

general formula **D** are then alkylated with compounds of the general formula **Y** in the same manner as for **B** to give **E**. Compounds of the general formula **Y** are prepared as described in Scheme 7 (below) or are readily available from commercial sources. Compounds of the general formula **E** are then saponified with  $\text{LiOH}$  in the THF to give the final compound **F**.

5



10

Scheme 2 covers the preparation of compounds of Formula I-II wherein  $\text{X}^0$  is

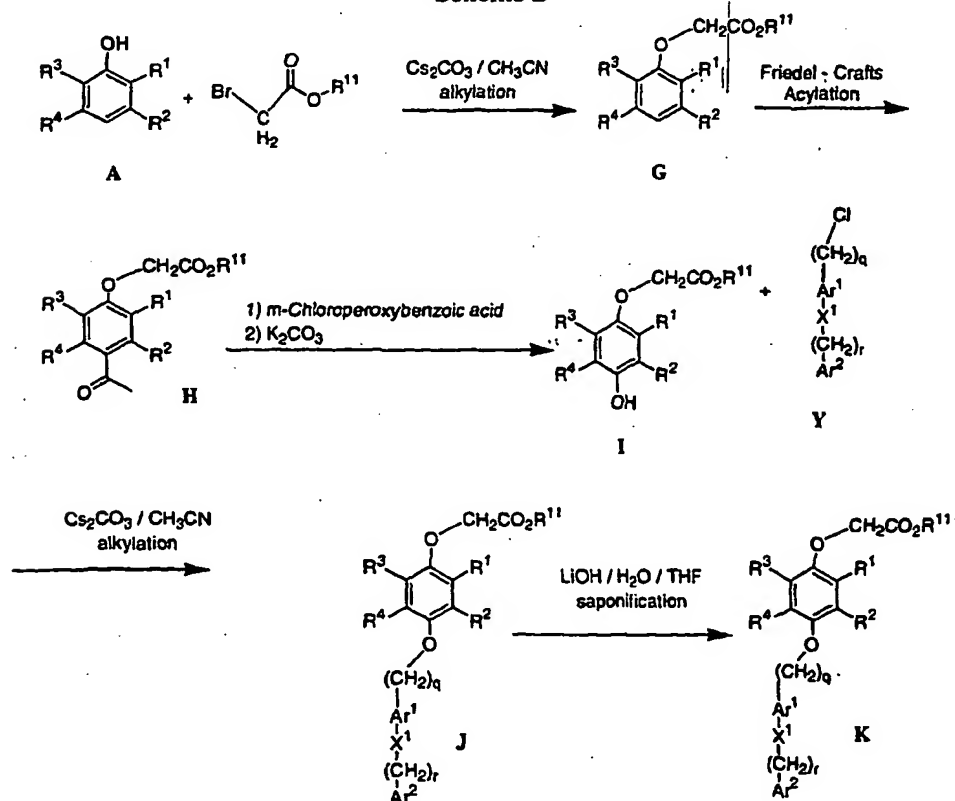
O, q is 0-3,  $\text{X}^1$  is absent,  $\text{X}^0$  is absent, and r is 0. Compounds of the general

-43-

formula A are alkylated with an alkyl haloacrylate to give compounds of the general formula G. The preferred alkyl haloacrylate is methyl bromoacetate. Alternate routes to compounds of formula G when Y is O will be readily apparent to a person skilled in the art of organic synthesis. Compounds of the general formula G are then acylated using Friedel-Crafts conditions to give compounds of the general formula H which are then oxidized with m-chloroperoxybenzoic acid followed by hydrolysis to give phenolic compounds of the general formula I. Compounds of the general formula I are then reacted in a similar manner as for D to give after saponification with LiOH in THF, compounds of the general formula K.

10


Scheme 2





-44-

Scheme 3 covers the preparation of compounds of formula I-II wherein  $X^0$  is

$-\text{CH}_2-\text{CH}_2-$ ,  $-\text{C}=\text{C}-$ , q is 0-3,  $X^1$  is absent,  is absent, and r is 0.

Compounds of the general formula A are brominated with bromine, using acetic acid as solvent to give L. Alternatively, N-bromosuccinimide may be used in place of

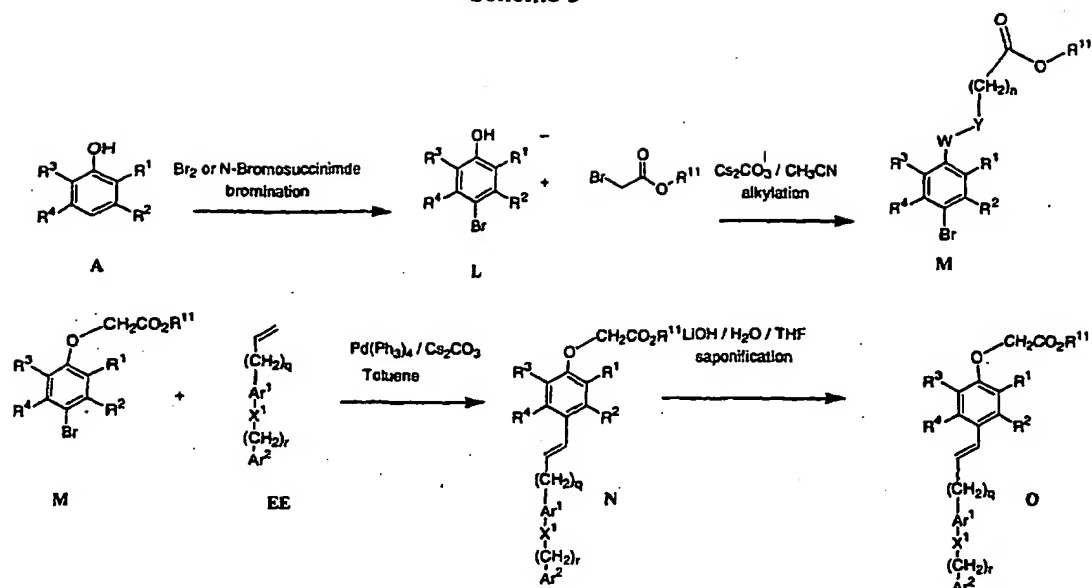
5 bromine and dichloromethane in place of acetic acid as solvent. Compounds of the general formula L are then alkylated with an alkyl haloacrylate to give compounds of the general formula M. The preferred alkyl haloacrylate is methyl bromoacetate. Alternate routes to compounds of formula M will be readily apparent to a person skilled in the art of organic synthesis. Compounds of the general formula

10 M are then reacted in the presence of tetrakis (triphenylphosphine)palladium(0) and biphenyl compounds of the general formula EE to give compounds of the general formula N. Compounds of the general formula EE are prepared as described in Scheme 9 or are readily available from commercial sources. Compounds of the

15 O.

-45-

Scheme 3



5

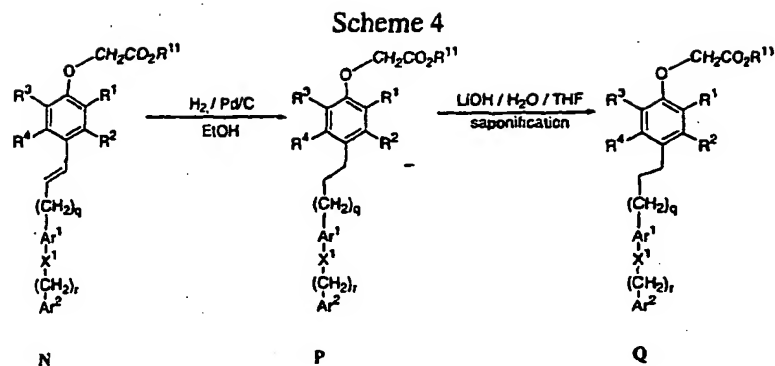
Scheme 4 covers the preparation of compounds of formula I-II wherein  $\text{X}^0$  is



$-\text{CH}_2-\text{CH}_2-$ ,  $q$  is 0-3,  $\text{X}^1$  is absent,  $-\text{CH}_2-\text{CH}_2-$  is absent, and  $r$  is 0. Accordingly, compounds of the general N can be reduced with hydrogen and palladium as catalyst to give compounds of the general formula P which are then saponified  $\text{LiOH}$  in  $\text{THF}$  to give the final compound Q.

10

-46-



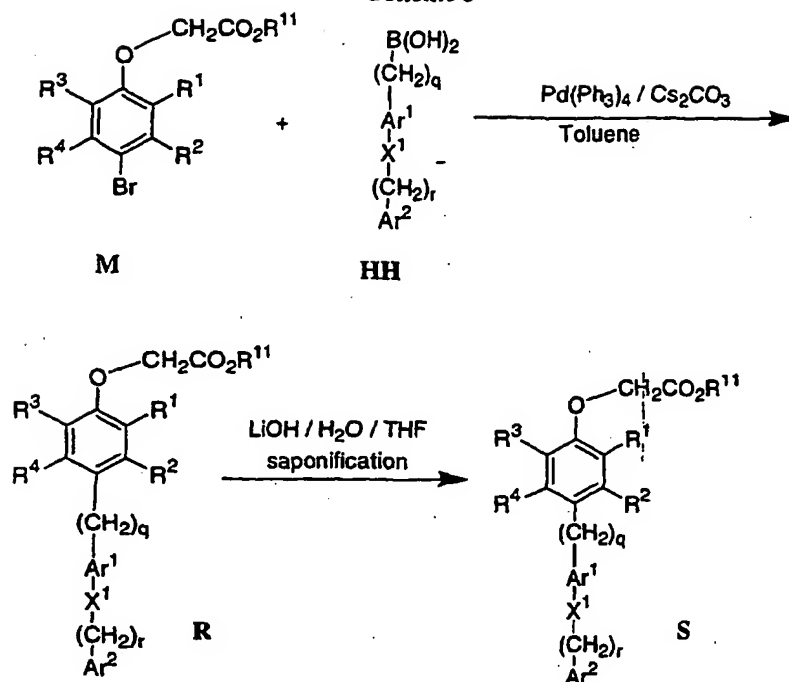
5                      Scheme 5 covers the preparation of compounds of formula I-II wherein  $X^0$  is

absent,  $q$  is 0,  $X^1$  is absent,  $V^1$  is absent, and  $r$  is 0 are prepared. Compounds of the general formula M are allowed to react with tetrakis (triphenylphosphine) palladium(0) and biphenyl compounds of the general formula HH to give compounds of the general formula R. Compounds of the general formula HH are prepared as described in Scheme 10 or are readily available from commercial sources.

10                      Compounds of the general formula R are then saponified with LiOH in THF to give the final compound S.

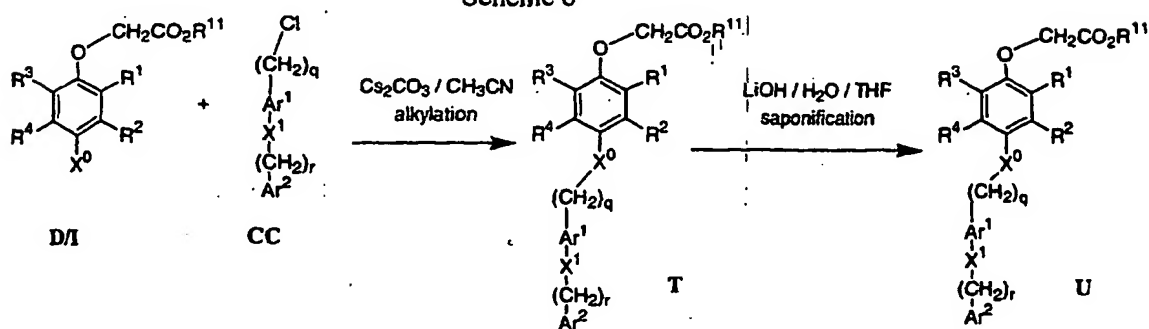
-47-

Scheme 5



With reference to Scheme 6, compounds of formula I-II wherein  $\text{X}^0$  is S or O, q is 1-3,  $\text{X}^1$  is O, and r is 1-3 are prepared using the same conditions utilized for the preparation of K.

Scheme 6



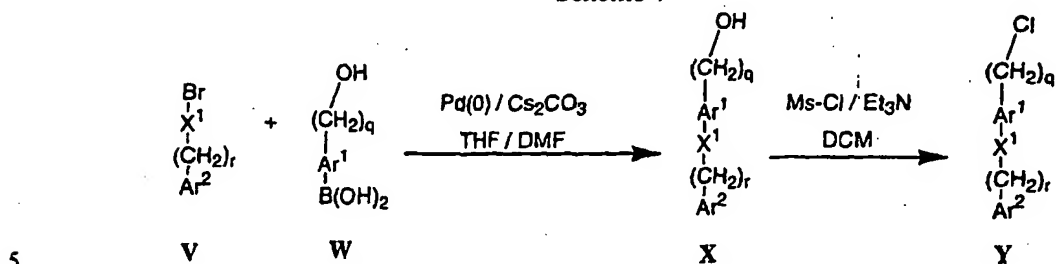
10

With reference to Scheme 7, compounds of the general formula X are prepared by reacting aryl boronic acid W with aryl bromide V in the presence of

-48-

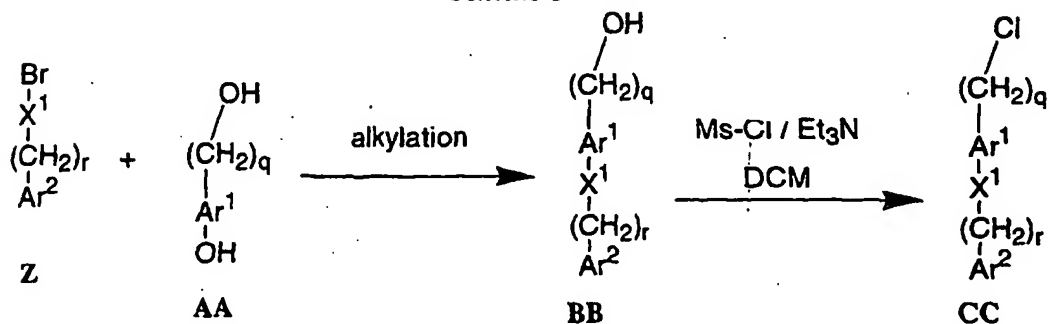
Pd(0) and cesium carbonate. Compounds of the general formula **X** are then reacted with methanesulfonyl chloride to give chlorides of the general formula **Y**.

Scheme 7



10 With reference to Scheme 8, compounds of the general formula **CC** are prepared wherein an appropriate hydroxy benzyl alcohol **AA** is alkylated with an appropriate bromide **Z**. The resulting compound **BB** is then reacted with methanesulfonyl chloride to give chlorides of the general formula **CC**.

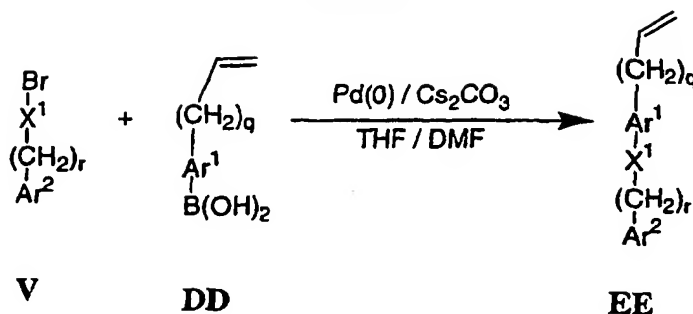
Scheme 8



With reference to Scheme 9, compounds of the general formula **EE** are prepared by reacting aryl boronic acid **V** with aryl bromide **DD** in the presence of Pd(0) and cesium carbonate.

-49-

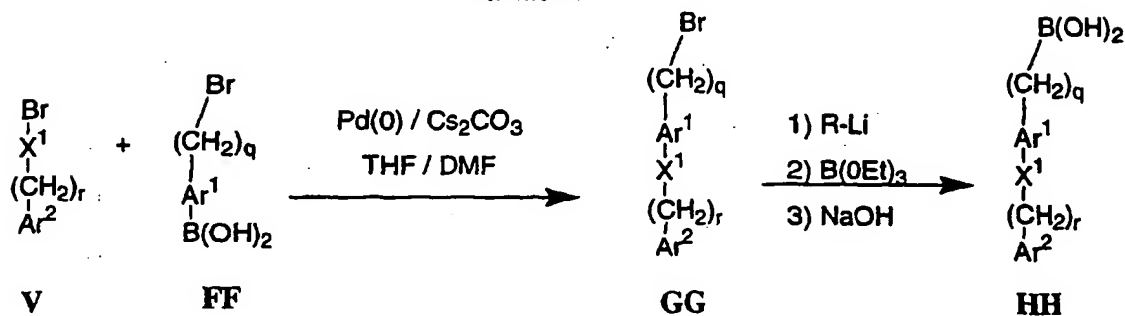
Scheme 9



5 With reference to Scheme 10, compounds of the general formula **HH** are prepared by reacting aryl bromide **V** with boronic acid **FF** to give **GG**. Compounds of the general formula **GG** are then reacted with an alkyl lithium reagent and then quenched with a borate which is hydrolyzed to give compounds of the general formula **HH**.

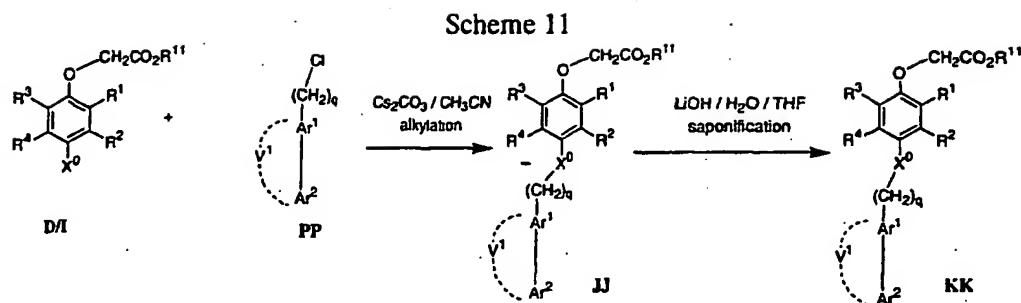
10

Scheme 10



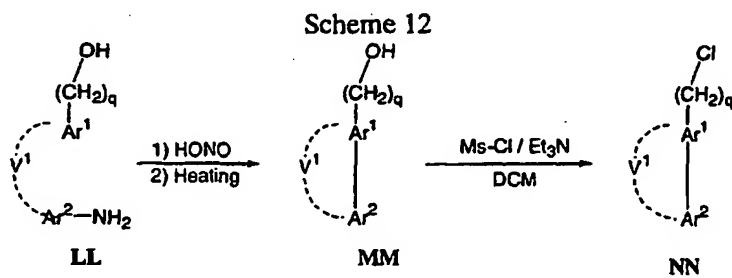
15 With reference to Scheme 11, compounds of formula **I-II** wherein  $\text{X}^0$  is S or O, q is 1-3,  $\text{X}^1$  is absent, r is 0, and  $\text{V}^1$  is a saturated or unsaturated hydrocarbon chain which is substituted or unsubstituted are prepared using the same conditions utilized for the preparation of **K**. Compounds of the general formula **NN** are prepared as described in Scheme 12 or are readily available from commercial sources.

-50-



5 With reference to Scheme 12, compounds of the general formula NN can be prepared by reacting an appropriately substituted aryl amine LL under Sandmeyer conditions followed by heating to give intermediate MM. The resulting intermediate MM is then reacted with methanesulfonyl chloride to give chlorides of the general formula NN.

10



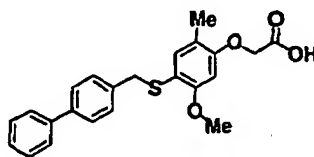
15 Not all compounds of Formulas I-II falling into a given class may be compatible with some of the reaction conditions described. Such restrictions are readily apparent to those skilled in the art of organic synthesis, and alternative methods must then be used.

20 The following non-limiting descriptions also demonstrate methods for the synthesis of compounds of Formulae I and II.

-51-

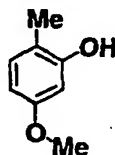
## Example 1

Synthesis of [4-(Biphenyl-4-yl)methylsulfanyl]-5-methoxy-2-methyl-phenoxy]-  
acetic acid (compound 1)



1

## Step 1. Preparation of 5-Methoxy-2-methyl-phenol (compound 1A)



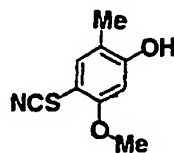
1A

2-Hydroxy-4-methoxy-benzaldehyde (3 g, 19.7 mmol), ammonium formate (6.2 g, 99 mmol) and palladium/carbon (900 mg @ 10%) were added to 26 ml glacial acetic acid and heated at 110 °C for 1 h. The reaction was cooled, filtered, and diluted with water (100 ml). The crude product was extracted with chloroform (3x50 ml), washed with water, brine, and dried over anhydrous sodium sulfate. The resulting solution was concentrated and used for the next step without further purification. MS  $m/z$  139 (M+1).



-52-

**Step 2. Preparation of 5-Methoxy-2-methyl-4-thiocyanato-phenol (compound 1B)**

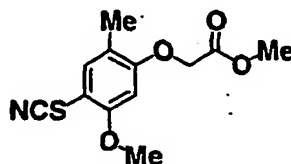
**1B**

5

The product from **Example 1A** (3.5 g, 25 mmol), sodium thiocyanate (6.48 g, 80 mmol), and sodium bromide (2.6 g, 25 mmol) were dissolved in 30 ml anhydrous methanol. Bromine (4.4 g, 28 mmol) was added drop wise over 15 minutes and allowed to stir at ambient temperature for 1 h. Brine was added (50 ml) and the crude product was extracted into ethyl acetate (3x100 ml). The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, decanted, and concentrated to afford the title product in good purity. 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 10.13 (s, 1H), 7.25 (s, 1H), 6.54 (s, 1H), 3.77 (s, 3H), 2.0 (s, 3H); MS *m/z* 196 (M+1).

15

**Step 3. Preparation of (5-Methoxy-2-methyl-4-thiocyanato-phenoxy)-acetic acid methyl ester (compound 1C)**

**1C**

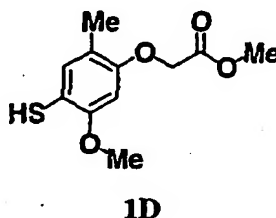
20

The product from **Example 1B** (620 mg, 3.2 mmol), methyl bromoacetate (854 mg, 3.5 mmol), and cesium carbonate (3.1 g, 9.6 mmol) were stirred in 10 ml anhydrous acetonitrile at ambient temperature for 1 h. The reaction was filtered through Celite®, concentrated, and purified using normal phase chromatography. 400 MHz <sup>1</sup>H NMR

-53-

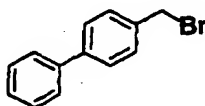
(DMSO- $d_6$ )  $\delta$  7.33 (s, 1H), 6.72 (s, 1H), 4.93 (s, 2H), 3.84 (s, 3H), 3.66 (s, 3H), 2.09 (s, 3H); MS  $m/z$  268 (M+1).

5      **Step 4. Preparation of (4-Mercapto-5-methoxy-2-methyl-phenoxy)-acetic acid methyl ester (compound 1D)**



10      The product from Example 1C (1.1 g, 4.1 mmol) and dithiothreitol (824 mg, 5.4 mmol) were dissolved in 20 ml methanol with 2.5 ml water. The solution was refluxed for 4 h, cooled, concentrated, and purified by normal phase chromatography. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.02 (s, 1H), 6.54 (s, 1H), 4.79 (s, 2H), 4.41 (s, 1H), 3.72 (s, 3H), 3.64 (s, 3H), 2.02 (s, 3H); MS  $m/z$  243 (M+1).

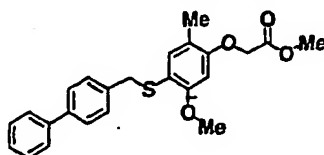
15      **Step 5. Preparation of 4-Bromomethyl-biphenyl (compound 1E)**



20      Biphenyl-4-yl-methanol (500 mg, 2.72 mmol) phosphorus tribromide (809 mg, 2.99 mmol), and lithium bromide (260 mg, 2.99 mmol) were dissolved in 10 ml DMF and stirred at ambient temperature for 1 h. Water (10 ml) was added and the crude product was extracted into dichloromethane, dried over anhydrous sodium sulfate, filtered through silica gel, and concentrated. MS  $m/z$  167 (M+1-Br).

-54-

**Step 6. Preparation of [4-(Biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methylphenoxy]-acetic acid methyl ester (compound 1F)**

**1F**

5

The product from Example 1D (100 mg, 0.38 mmol), the product from Example 1E (92 mg, 0.38 mmol) and cesium carbonate (250 mg, 0.76 mmol) were added to 5 ml acetonitrile and stirred at ambient temperature for 4 hr. The reaction was filtered through Celite<sup>®</sup>, concentrated and purified through normal phase chromatography. MS *m/z* 409 (M+1).

10

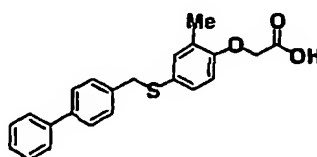
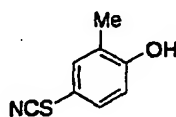
**Step 7. Preparation of [4-(Biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methylphenoxy]-acetic acid (compound 1)**

15

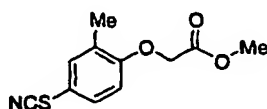
The product from Example 1F (101 mg) was dissolved in 10 ml THF /water solution (10:1). Lithium hydroxide monohydrate (300 mg) was added and stirred for 30 minutes. 2 Normal aqueous HCl was added to pH<5 and then washed with ethyl acetate. The organic extract was dried over anhydrous sodium sulfate, decanted, and concentrated. The title product was recrystallized from chloroform/hexanes. mp 60-62 °C; 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 12.94 (br(s), 1H), 7.58 (d, 2H, *J* = 8 Hz), 7.52 (d, 2H, *J* = 8 Hz), 7.39 (t, 2H, *J* = 7.2 Hz), 7.30 (m, 3H), 7.02 (s, 1H), 6.52 (s, 1H), 4.69 (s, 2H), 4.01 (s, 2H), 3.73 (s, 3H), 2.01 (s, 3H). MS *m/z* 393 (M-1). Anal. Calc'd for C<sub>32</sub>H<sub>22</sub>O<sub>4</sub>S·3H<sub>2</sub>O C, 69.05; H, 5.07; found: C, 69.04; H, 5.35.

20

-55-

**Example 2****Synthesis of [4-(Biphenyl-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid**  
**(compound 2)****2****Step 1. Preparation of 2-Methyl-4-thiocyanato-phenol (compound 2A)****2A**

The title compound was prepared in a manner analogous to **Example 1B** from 2-methylphenol. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  10.09 (s, 1H), 7.36 (s, 1H), 7.30 (d, 1H,  $J = 8.1$  Hz), 6.83 (d, 1H,  $J = 8.1$  Hz), 2.08 (s, 3H); MS  $m/z$  166 ( $M+1$ ).

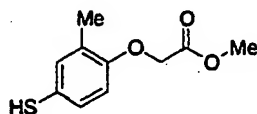
**Step 2. Preparation of (2-Methyl-4-thiocyanato-phenoxy)-acetic acid methyl ester (compound 2B)****2B**

The title compound was prepared from 2 **Example 2A** in a manner analogous to **Example 1C**. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.46 (s, 1H), 6.95 (d, 1H,  $J = 8.5$

-56-

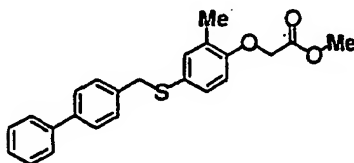
Hz), 6.80 (d, 1H,  $J = 8.5$  Hz), 4.86 (s, 2H), 3.65 (s, 3H), 2.17 (s, 3H); MS  $m/z$  238 (M+1).

**Step 3. Preparation of (4-Mercapto-2-methyl-phenoxy)-acetic acid methyl ester (compound 2C)**

**2C**

The title compound was prepared from (2-methyl-4-thiocyanato-phenoxy)-acetic acid methyl ester in a manner analogous to Example 1D. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.05 (s, 1H), 7.00 (d, 1H,  $J = 10.3$  Hz), 6.70 (d, 1H,  $J = 10.3$  Hz), 5.00 (s, 1H), 4.73 (s, 1H), 3.63 (s, 3H), 2.09 (s, 3H); MS  $m/z$  213 (M+1).

**Step 4. Preparation of [4-(Biphenyl-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid methyl ester (compound 2D)**

**2D**

The title compound was prepared in the manner analogous to Example 1F using 2C and 1E. MS  $m/z$  379 (M+1).

**Step 5. Preparation of [4-(Biphenyl-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid (compound 2)**

The title compound was prepared in the manner analogous to Example 1. mp 138 °C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.59 (d, 2H,  $J = 9.5$  Hz); 7.53 (d, 2H,  $J = 9.5$  Hz),

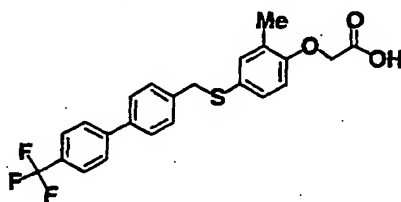
-57-

7.40 (m, 2H), 7.31(m, 3H), 7.14 (d, 1H,  $J = 1.7$  Hz), 7.09 (d, 1H,  $J = 10.7$  Hz), 6.70 (d, 1H,  $J = 10.7$  Hz), 4.62 (s, 2H), 4.11 (s, 2H), 2.09 (s, 3H); MS  $m/z$  363 (M-1).

### Example 3

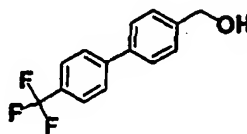
5

#### Synthesis of [2-Methyl-4-(4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-phenoxy]-acetic acid (compound 3)



3

10 Step 1. Preparation of (4'-Trifluoromethyl-biphenyl-4-yl)-methanol (compound 3A)

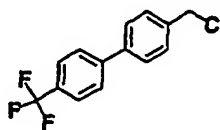


3A

15 1-Bromo-4-trifluoromethyl-benzene (814 mg, 3.62 mmol), 4-hydroxymethylphenylboronic acid (600 mg, 3.98 mmol), cesium carbonate (2.36 g, 7.24 mmol), and  $\text{PdCl}_2(\text{dppf})$  (132 mg, 0.181 mmol) were added to 10 ml of a 1:1 solution of DMF/THF. The reaction was flushed with nitrogen and heated to  $90^\circ\text{C}$  for 1 h. The reaction was cooled, poured into diethyl ether and washed with water  
20 (2x50 ml), brine (1x50ml) and dried over anhydrous sodium sulfate. The crude product was filtered through silica gel, eluted with diethyl ether, and concentrated to provide the title compound. MS  $m/z$  251 (M-1).

-58-

**Step 2. Preparation of 4-Chloromethyl-4'-trifluoromethyl-biphenyl (compound 3B)**

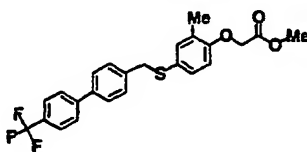
**3B**

5

The product from Example 3A was dissolved in 10 ml methylene chloride. Triethylamine (468 mg, 4.62 mol) and methanesulfonyl chloride (422 mg, 3.68 mmol) were then added and stirred for 18 h. The reaction was poured into water and extracted with methylene chloride. The organic solution was dried over anhydrous sodium sulfate, decanted and concentrated to provide the title compound that was used without further purification. MS  $m/z$  235 ( $M-Cl+1$ ).

10

**Step 3. Preparation of [2-Methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 3C)**

**3C**

15

The title compound was prepared in the manner analogous to Example 1F using 3B and 2C. MS  $m/z$  447 ( $M+1$ ).

20

**Step 4. Preparation of [2-Methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 3)**

The title compound was prepared in the manner analogous to Example 1 using 3C.

25

mp 140-141 °C; 400 MHz  $^1H$  NMR ( $DMSO-d_6$ )  $\delta$  12.95 (br(s), 1H), 7.82 (d, 2H,  $J =$

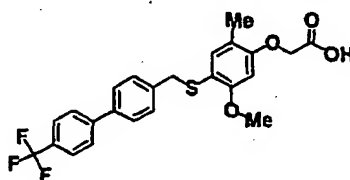
-59-

8.4 Hz), 7.74 (d, 2H,  $J = 8.4$  Hz), 7.61 (d, 2H,  $J = 8.4$  Hz), 7.35 (d, 2H,  $J = 8.4$  Hz), 7.10 (m, 2H), 6.70 (d, 1H,  $J = 8.4$  Hz), 4.62 (s, 2H), 4.13 (s, 2H), 2.08 (s, 3H); MS  $m/z$  431 (M-1). Anal. Calc'd for  $C_{23}H_{19}F_3O_3S \cdot 0.7 H_2O$  C, 62.07; H, 4.62; found: C, 61.98; H, 4.22.

5

#### Example 4

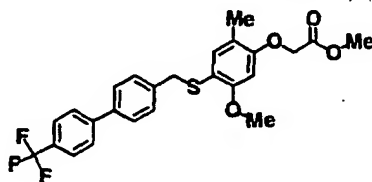
##### Synthesis of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 4)



10

4

##### **Step 1. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 4A)**



15

4A

The title compound was prepared in the manner analogous to Example 1F using 1D and 3B. MS  $m/z$  477 (M+1).

20

##### **Step 2. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 4)**

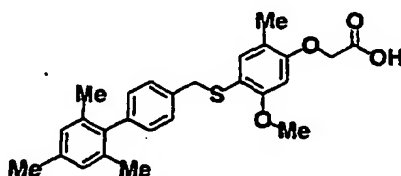


-60-

The title compound was prepared in the manner analogous to Example 1 using 4A.  
 mp 170-171 °C; 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 7.81 (d, 2H, *J* = 8 Hz), 7.60 (d,  
 2H, *J* = 8.4 Hz), 7.32 (d, 2H, *J* = 8.4 Hz), 7.02 (s, 1H), 6.52 (s, 1H), 4.70 (s, 2H), 4.03  
 (s, 2H), 3.73 (s, 3H), 2.00 (s, 3H). MS *m/z* 463 (M+1). Anal. Calc'd for  
 C<sub>24</sub>H<sub>21</sub>F<sub>3</sub>NO<sub>4</sub>S · 0.1 H<sub>2</sub>O C, 62.09; H, 4.60; found: C, 62.00; H, 4.36.

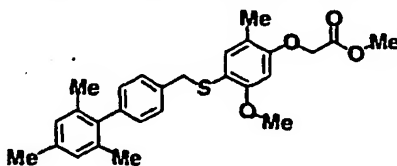
### Example 5

#### Synthesis of [5-Methoxy-2-methyl-4-(2',4',6'-trimethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 5)



5

#### Step 1. Preparation of [5-Methoxy-2-methyl-4-(2',4',6'-trimethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 5A)



5A

2-Bromo-1,3,5-trimethyl-benzene (396 mg, 2mmol), 4-hydroxymethylphenylboronic acid (334 mg, 2.2 mmol), cesium carbonate (1.3 g, 4 mmol), and PdCl<sub>2</sub>(dppf) (82 mg, 0.1 mmol) were added to 5 ml of a 1:1 solution of DMF/THF. The reaction was flushed with nitrogen and heated to 90°C for 1 h. The reaction was cooled, poured into diethyl ether and washed with water (2x10 ml), brine (1x10ml) and dried over anhydrous sodium sulfate. The organic solution was filtered through silica gel, eluted

-61-

with diethyl ether, and concentrated. The crude product was dissolved in 10 ml dichloromethane. Added to this solution were triethylamine (202 mg, 2 mmol) then methanesulfonyl chloride (184 mg, 1.6 mmol) and allowed to stir at ambient temperature for 18 h. The reaction was poured into water and extracted with  
5 methylene chloride. The organic solution was dried over anhydrous sodium sulfate, decanted and concentrated to provide the crude alkyl chloride. The product from **Example 1D** (387 mg, 1.6 mmol), the crude 4'-chloromethyl-2,4,6-trimethyl-biphenyl, and cesium carbonate (1 g, 3.06 mmol) were stirred in 10 ml acetonitrile for 3h, filtered, concentrated, and purified by normal phase chromatography to afford the  
10 title product. MS  $m/z$  451 (M+1).

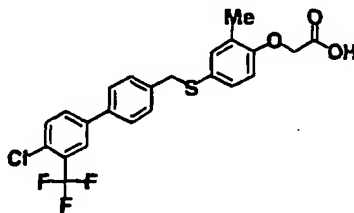
**Step 2. Preparation of [5-Methoxy-2-methyl-4-(2',4',6'-trimethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid**

15 The title compound was prepared in the manner analogous to **Example 1** using **5A**. mp 141 °C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.81 (br(s), 1H), 7.04 (d, 2H,  $J = 8.4$  Hz), 6.77 (m, 3H), 6.69 (s, 2H), 6.36 (s, 1H), 4.43 (s, 2H), 3.82 (s, 2H), 3.58 (s, 3H), 2.03 (s, 3H), 1.82 (s, 3H), 1.67 (s, 6H). MS  $m/z$  437 (M+1).

20

**Example 6**

**Synthesis of [4-(4'-Chloro-3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid (compound 6)**

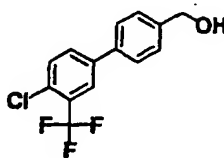


25

6

-62-

**Step 1. Preparation of (4'-Chloro-3'-trifluoromethyl-biphenyl-4-yl)-methanol (compound 6A)**

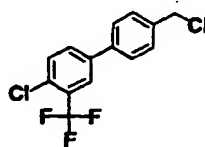
**6A**

5

The title compound was prepared in the manner analogous to **Example 3A** using 4-bromo-1-chloro-2-trifluoromethyl-benzene. MS  $m/z$  288 (M+1).

**Step 2. Preparation of 4-Chloro-4'-chloromethyl-3-trifluoromethyl-biphenyl (compound 6B)**

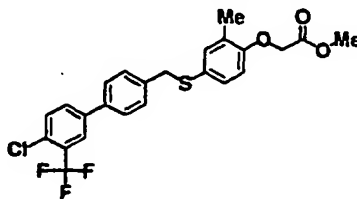
10

**6B**

15

The title compound was prepared in the manner analogous to **Example 3B** using **6A**. MS  $m/z$  305 (M).

**Step 3. Preparation of [4-(4'-Chloro-3'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-2-methyl-phenoxy]-acetic acid methyl ester (compound 6C)**

**6C**

20

-63-

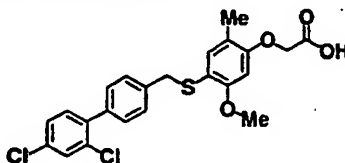
The title compound was prepared in the manner analogous to Example 1F using 2C and 6B. MS  $m/z$  481 (M+1).

5      **Step 4. Preparation of [4-(4'-Chloro-3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid (compound 6)**

The title compound was prepared in the manner analogous to Example 1 using 6C.  
400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.97 (s, 1H), 7.92 (d, 1H,  $J = 10.5$  Hz), 7.74 (d, 1H,  
10       $J = 10.5$  Hz), 7.64 (d, 2H,  $J = 8.9$  Hz), 7.34 (d, 2H,  $J = 8.9$  Hz), 7.14 (s, 1H), 7.08 (d,  
1H,  $J = 11.0$  Hz), 6.70 (d, 1H,  $J = 11.0$  Hz), 4.62 (s, 2H), 4.12 (s, 2H), 2.08 (s, 3H);  
MS  $m/z$  465 (M-1).

15      **Example 7**

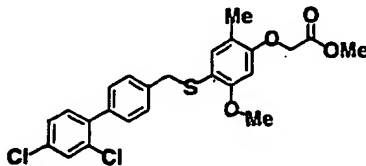
**Synthesis of [4-(2',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid (compound 7)**



7

20

**Step 1. Preparation of [4-(2',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid methyl ester (compound 7A)**



7A

-64-

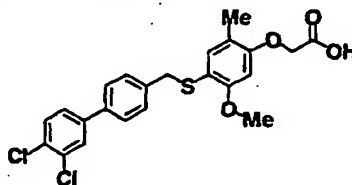
The title compound was prepared in the manner analogous to **Example 5A** using **1D** and 1-bromo-2,4-dichloro-benzene. MS  $m/z$  479 ( $M+2$ ).

5      **Step 2. Preparation of [4-(2',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid (compound 7)**

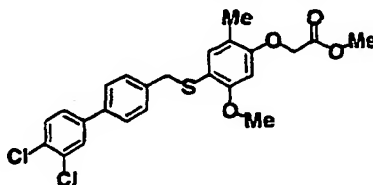
The title compound was prepared in the manner analogous to **Example 1** using **7A**.  
400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.95 (br(s), 1H), 7.67 (dd, 1H,  $J = 2$  Hz,  $J' = 8.4$  Hz), 7.43 (d, 1H,  $J = 2.4$  Hz), 7.37 (s, 1H), 7.28 (s, 4H), 7.02 (s, 1H), 6.52 (s, 1H), 4.70  
10 (s, 2H), 4.02 (s, 2H), 3.72 (s, 3H), 2.01 (s, 3H); MS  $m/z$  465 ( $M+2$ ).

**Example 8**

15      **Synthesis of [4-(3',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid (compound 8)**

**8**

20      **Step 1. Preparation of [4-(3',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid methyl ester (compound 8A)**

**8A**

-65-

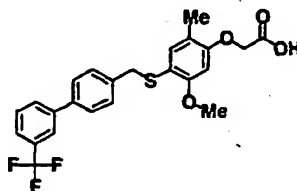
The title compound was prepared in the manner analogous to **Example 5A** using **1D** and 4-bromo-1,2-dichloro-benzene. MS  $m/z$  479 (M+2).

**Step 2. Preparation of [4-(3',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid (compound 8)**

The title compound was prepared in the manner analogous to **Example 1** using **8A**. mp 161-162°C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.87 (d, 1H,  $J = 2$  Hz), 7.57-7.66 (m, 4H), 7.29 (d, 2H,  $J = 8.4$  Hz), 7.01 (s, 1H), 6.52 (s, 1H), 4.69 (s, 2H), 4.02 (s, 2H), 3.72 (s, 3H), 2.03 (s, 3H); MS  $m/z$  494 (M+1).

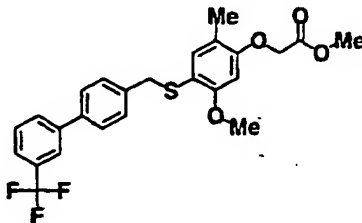
**Example 9**

**Synthesis of [5-Methoxy-2-methyl-4-(3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 9)**



9

**Step 1. Preparation of [5-Methoxy-2-methyl-4-(3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 9A)**



9A

-66-

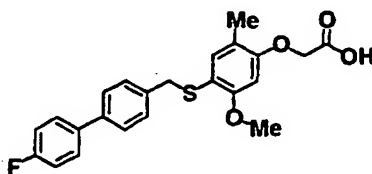
The title compound was prepared in the manner analogous to Example 5A using 1D and 1-bromo-3-trifluoromethyl-benzene. MS  $m/z$  477 (M+1).

**Step 2. Preparation of [5-Methoxy-2-methyl-4-(3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 9)**

The title compound was prepared in the manner analogous to Example 1 using 9A: mp 138-139 °C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.95 (br(s), 1H), 7.91 (m, 2H), 7.63 (m, 4H), 7.32 (d, 2H,  $J = 8.4$  Hz), 7.02 (s, 1H), 6.52 (s, 1H), 4.69 (s, 2H), 4.03 (s, 2H), 3.73 (s, 3H), 2.06 (s, 3H); MS  $m/z$  463 (M+1).

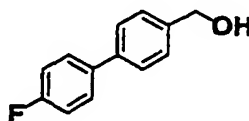
**Example 10**

**Synthesis of [4-(4'-Fluoro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid (compound 10)**



**10**

**Step 1. Preparation of (4'-Fluoro-biphenyl-4-yl)-methanol (compound 10A)**

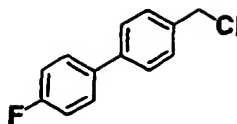


**10A**

The title compound was prepared in the manner analogous to Example 3A using 1-bromo-4-fluorobenzene. MS  $m/z$  185 (M-H $_2$ O).

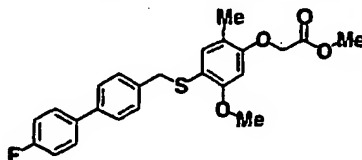
**Step 2. Preparation of 4-Chloromethyl-4'-fluoro-biphenyl (compound 10B)**

-67-

**Example 10B**

The title compound was prepared in the manner analogous to **Example 3B** using  
 5 **10A**. MS  $m/z$  222 ( $M+2$ ).

**Step 3. Preparation of [4-(4'-Fluoro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid methyl ester (compound 10C)**

**10C**

The title compound was prepared in the manner analogous to **Example 1F** using **10B**  
 and **1D**. MS  $m/z$  427 ( $M+1$ ).

**Step 4. Preparation of [4-(4'-Fluoro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid**

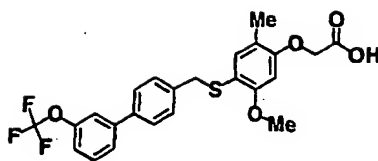
The title compound was prepared in the manner analogous to **Example 1** using **10C**.  
 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.93 (br(s), 1H), 7.62 (m, 2H), 7.49 (d, 2H,  $J$  =  
 8.4 Hz), 7.27 (d, 2H,  $J$  = 8.4 Hz), 7.22 (m, 2H), 7.02 (s, 1H), 6.52 (s, 1H), 4.69 (s,  
 20 2H), 4.01 (s, 2H), 3.73 (s, 3H), 2.01 (s, 3H). MS  $m/z$  411 ( $M-1$ ).

**Example 11**

Synthesis of [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 11)

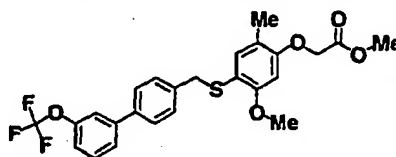


-68-



11

Step 1. Preparation of [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 11A)



11A

The title compound was prepared in the manner analogous to Example 5A using 1D and 1-bromo-3-trifluoromethoxy-benzene. MS  $m/z$  493 (M+1).

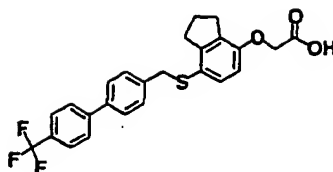
Step 2. Preparation of [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 11)

The title compound was prepared in the manner analogous to Example 1 using 11A. mp 137 °C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.95 (br(s), 1H), 7.66 (d, 1H,  $J = 8.8$  Hz), 7.56 (m, 4H), 7.30 (m, 3H), 7.02 (s, 1H), 6.52 (s, 1H), 4.69 (s, 2H), 4.02 (s, 2H), 3.73 (s, 3H), 2.01 (s, 3H). MS  $m/z$  493 (M+1).

## Example 12

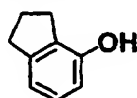
Synthesis of [7-(4'-Trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid (compound 12)

-69-



12

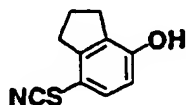
### Step 1. Preparation of Indan-4-ol (compound 12A)



12A

A mixture of 4-hydroxy-indan-1-one (5.0 g, 33.7 mmol), sodium cyanoborohydride (6.4 g, 101.1 mmol), and zinc iodide (32.3 g, 101.1 mmol) in dichloroethane, was heated at reflux for two hours. The reaction mixture was then filtered through 50 g SiO<sub>2</sub> while still warm, eluting further with dichloroethane. The filtrate was collected and concentrated under vacuum. The residue was added to diethyl ether and the resulting white precipitate was filtered off. The filtrate was collected and concentrated in vacuo to give 4.2 g of the title compound with purity high enough for subsequent use. 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 9.06 (s, 1H), 6.86 (t, 1H, *J* = 7.8 Hz), 6.59 (d, 1H, *J* = 7.8 Hz), 6.48 (d, 1H, *J* = 7.8 Hz), 2.75 (t, 2H, *J* = 7.3 Hz), 2.67 (t, 2H, *J* = 7.3 Hz), 1.92 (m, 2H).

### Step 2. Preparation of 7-Thiocyanato-indan-4-ol (compound 12B)



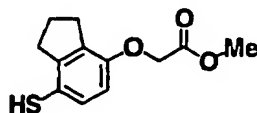
**12B**

The title compound was prepared in the manner analogous to **Example 1B** using **12A**. MS  $m/z$  192 (M+1).

-70-

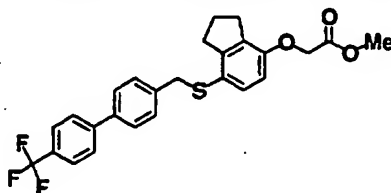
**Step 3. Preparation of (7-Mercapto-indan-4-yloxy)-acetic acid methyl ester (compound 12C)**

5

**12C**

10 7-Thiocyanato-indan-4-ol (Example 12B) ( 1.47g, 7.7 mmol), cesium carbonate (3.77g, 11.6 mmol) and methyl bromoacetate (1.24g, 8.08 mmol) were stirred in 20 ml acetonitrile at ambient temperature for 4 h. The reaction was filtered and concentrated. The crude product was treated under the conditions of Example 1D to afford the title product. MS  $m/z$  239 (M+1).

15 **Step 4. Preparation of [7-(4'-Trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid methyl ester (compound 12D)**

**12D**

20 The title compound was prepared in the manner analogous to Example 1F using 12C and 3B. MS  $m/z$  473 (M+1).

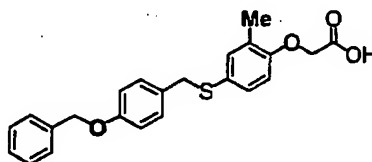
**Step 5. Preparation of [7-(4'-Trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid (compound 12)**

-71-

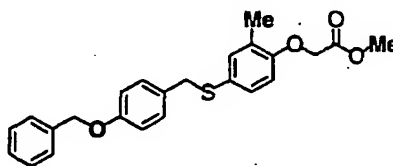
The title compound was prepared in the manner analogous to **Example 1** using **12D**. mp 158-159 °C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.94 (br(s), 1H), 7.82 (d, 2H,  $J$  = 8 Hz), 7.74 (d, 2H,  $J$  = 8.8 Hz), 7.60 (d, 2H,  $J$  = 6.4 Hz), 7.31 (d, 2H,  $J$  = 8 Hz), 7.08 (d, 1H,  $J$  = 8.8 Hz), 6.58 (d, 1H,  $J$  = 8.4 Hz), 4.61 (s, 2H), 4.06 (s, 2H), 2.72 (m, 4H), 1.90 (q, 2H); MS  $m/z$  457 (M-1).

### Example 13

#### Synthesis of [4-(4-Benzyloxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid (compound 13)

**13**

#### **Step 1. Preparation of [4-(4-Benzyloxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid methyl ester (compound 13A)**

**13A**

The title compound was prepared in the manner analogous to **Example 1F** using 1-chloromethyl-4-benzyloxy-benzene and **2C**. MS  $m/z$  409 (M+1).

#### **Step 2. Preparation of [4-(4-Benzyloxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid (compound 13)**

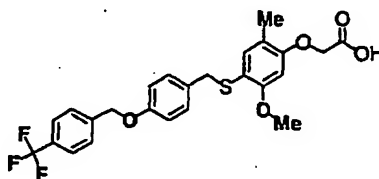
-72-

The title compound was prepared in the manner analogous to Example 1 and 13A.  
 mp 120 - 121°C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.39 – 7.25 (m, 5H), 7.15 – 7.03 (m, 4H), 6.85 (d, 2H,  $J = 8.5$  Hz), 6.68 (d, 1H,  $J = 8.4$  Hz), 5.00 (s, 2H), 4.62 (s, 2H), 4.00 (s, 2H), 2.08 (s, 3H); MS  $m/z$  395 (M+1).

5

#### Example 14

##### Synthesis of {5-Methoxy-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 14)

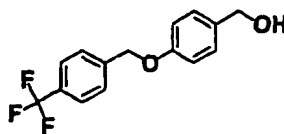


10

14

##### Step 1. Preparation of [4-(4-Trifluoromethyl-benzyloxy)-phenyl]-methanol (compound 14A)

15



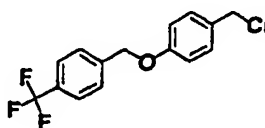
14A

4-Hydroxymethyl-phenol (1g, 8.06 mmol), 1-Chloromethyl-4-trifluoromethyl-benzene (1.57g, 8.06 mmol), and cesium carbonate (5.26g, 16.12 mmol) were refluxed in acetonitrile for 20h, cooled, filtered, and concentrated to give the title compound. MS  $m/z$  265 (M-H $_2$ O+1).

20

-73-

**Step 2. Preparation of 4-Chloromethyl-(4-trifluoromethyl-benzyloxy-benzene)  
(compound 14B)**

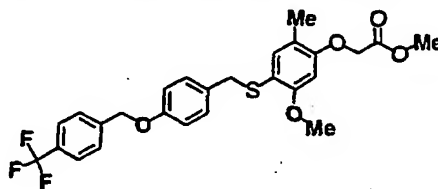


14B

5

The title compound was prepared in the manner analogous to Example 3B using 14A. MS  $m/z$  265 ( $M-Cl+1$ ).

**Step 3. Preparation of {5-Methoxy-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 14C)**



14C

15

The title compound was prepared in the manner analogous to Example 1F using 14B and 1D. MS  $m/z$  507 ( $M+1$ ).

**Step 4. Preparation of {5-Methoxy-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 14)**

The title compound was prepared in the manner analogous to Example 1 using 14C.  
mp 145 °C; 400 MHz  $^1H$  NMR ( $DMSO-d_6$ )  $\delta$  12.94 (br(s), 1H), 7.70 (d, 2H,  $J = 8$  Hz), 7.76 (d, 2H,  $J = 8$  Hz), 7.14 (d, 2H,  $J = 8.8$  Hz), 6.97 (s, 1H), 6.87 (m, 2H), 6.50 (s, 1H), 5.14 (s, 2H), 4.68 (s, 2H), 3.91 (s, 2H), 3.71 (s, 3H), 2.00 (s, 3H); MS  $m/z$  491 ( $M-1$ ).

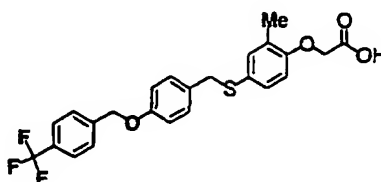
20

-74-

### Example 15

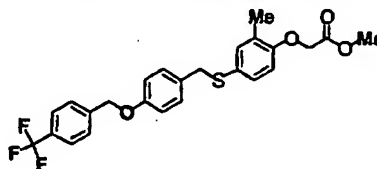
**Synthesis of {2-Methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 15)**

5



15

**Step 1. Preparation of {2-Methyl-4-[4-(4-trifluoromethyl-benzyloxy)-**  
**benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 15A)**



**15A**

15 The title compound was prepared in the manner analogous to **Example 1F** using **2C** and **14B**. MS  $m/z$  477 (M+1).

**Step 2. Preparation of {2-Methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 15)**

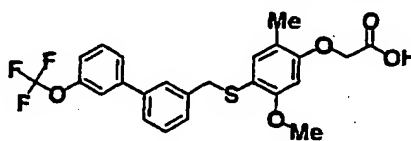
20 The title compound was prepared in the manner analogous to **Example 1** using **15A**. mp 133 °C; 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 7.70 (d, 2H, *J* = 8 Hz), 7.76 (d, 2H, *J* = 8 Hz), 7.14 (d, 2H, *J* = 8.8 Hz), 7.09 (m, 1H), 7.04 (dd, 1H, *J*<sub>1</sub> = 2.4 Hz, *J*<sub>2</sub> = 8.4 Hz),

-75-

6.87 (m, 2H), 6.68 (d, 1H,  $J=8.4$  Hz), 5.14 (s, 2H), 4.61 (s, 2H), 3.99 (s, 2H), 2.08 (s, 3H); MS  $m/z$  461 (M-1).

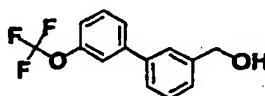
### Example 16

#### Synthesis of [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 16)



16

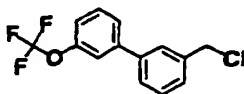
#### Step 1. Preparation of (3'-Trifluoromethoxy-biphenyl-3-yl)-methanol (compound 16A)



16A

The title compound was prepared in the manner analogous to **Example 3A** using 3-hydroxymethylphenylboronic acid and 1-bromo-3-trifluoromethoxy-benzene. MS  $m/z$  251 (M-1).

#### Step 2. Preparation of 3-Chloromethyl-3'-trifluoromethoxy-biphenyl (compound 16B)



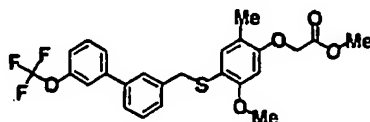
16B



-76-

The title compound was prepared in the manner analogous to **Example 3B** using **16A**. MS  $m/z$  251 (M-1).

**Step 2. Preparation of [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 16C)**

**16C**

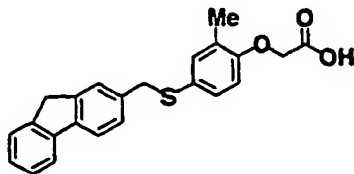
The title compound was prepared in the manner analogous to **Example 1F** using **16B** and **1D**. MS  $m/z$  491 (M-1).

**Step 4. Preparation of [5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 16)**

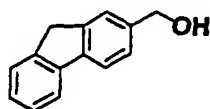
The title compound was prepared in the manner analogous to **Example 1** using **16C**. mp 92-94 °C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.96 (br(s), 1H), 7.55-7.24 (m, 8H), 7.01 (s, 1H), 6.52 (s, 1H), 4.68 (s, 2H), 4.03 (s, 2H), 3.72 (s, 3H), 1.99 (s, 3H); MS  $m/z$  479 (M+1).

### **Example 17**

**Synthesis of [4-(9H-Fluoren-2-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid (compound 17)**

**17**

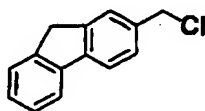
-77-

**Step 1. Preparation of (9H-Fluoren-2-yl)-methanol (compound 17A)****17A**

5

9H-Fluorene-2-carbaldehyde (500 mg, 2.6 mmol) was dissolved in 10 ml methanol. Sodium borohydride (200 mg, 5.2 mmol) was added and allowed to stir at ambient temperature for 1 h. Water (10 ml) was added and the crude product was extracted into ethyl acetate (50 ml), washed with brine (50 ml), dried over anhydrous sodium sulfate, decanted and concentrated to afford the title product in good purity. MS  $m/z$  195 (M+1).

10

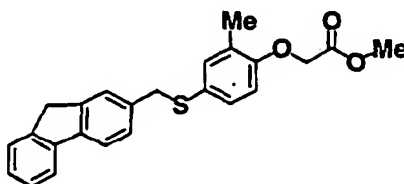
**Step 2. Preparation of 2-Chloromethyl-9H-fluorene (compound 17B)****17B**

15

The title compound was prepared in the manner analogous to **Example 3B** using 17A. MS  $m/z$  179 (M-Cl+1).

**Step 3. Preparation of [4-(9H-Fluoren-2-yl)methylsulfanyl-2-methyl-phenoxy]-acetic acid methyl ester (compound 17C)**

20

**17C**

-78-

The title compound was prepared in the manner analogous to Example 1F using 17B and 2C. MS  $m/z$  422 (M+1).

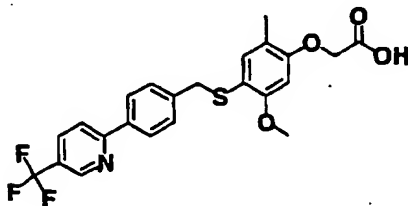
5      **Step 4. Preparation of [4-(9H-Fluoren-2-ylmethylsulfanyl-2-methyl-phenoxy)]-acetic acid (compound 17)**

The title compound was prepared in the manner analogous to Example 1 using 17C.  
 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.93 (br(s), 1H), 7.80 (d, 1H,  $J = 7.6$  Hz), 7.23 (d, 1H,  $J = 8$  Hz), 7.5 (d, 1H,  $J = 7.6$  Hz), 7.43 (s, 1H), 7.31 (t, 1H,  $J = 6.4$  Hz), 7.24 (m, 2H), 7.15 (m, 1H), 7.08 (dd, 1H,  $J = 2.4$  Hz,  $J' = 8.4$  Hz), 6.7 (d, 1H,  $J = 8.8$  Hz), 4.62 (s, 2H), 4.13 (s, 2H), 3.82 (s, 2H), 2.09 (s, 3H). MS  $m/z$  375 (M-1). Anal. Calc'd for  $\text{C}_{23}\text{H}_{20}\text{O}_3\text{S} \cdot 0.3 \text{ H}_2\text{O}$  C, 72.34; H, 5.44; found: C, 72.46; H, 5.20.

15

**Example 18**

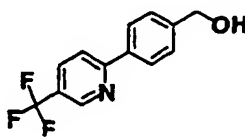
**Synthesis of [4-(5-Methoxy-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy]-acetic acid (compound 18)**



18

20

**Preparation of [4-(5-Trifluoromethyl-pyridin-2-yl)-phenyl]-methanol (compound 18A)**



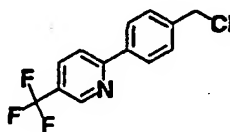
18A

-79-

The title compound was prepared from 2-Chloro-5-trifluoromethyl-pyridine and 4-(hydroxymethyl)boronic acid  $\text{PdCl}_2(\text{dppb})$  catalyst in the manner analogous to

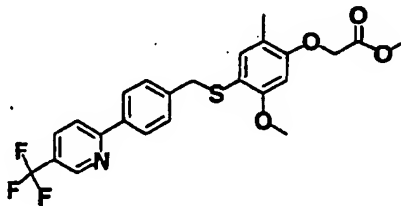
**Example 3A.** 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  8.98 (s, 1H), 8.2 (dd, 1H,  $J = 2.4$  Hz,  $J' = 8.4$  Hz), 8.09 (m, 3H), 7.42 (d, 2H,  $J = 8.54$  Hz), 5.23 (t, 1H), 4.54 (d, 2H,  $J = 6$  Hz); MS  $m/z$  254 ( $M+1$ ).

**Preparation of 2-(4-Chloromethyl-phenyl)-5-trifluoromethyl-pyridine (compound 18B)**

**18B**

The title compound was prepared in the manner analogous to **Example 3B** using **18A**. MS  $m/z$  272 ( $M+1$ ).

**Preparation of {5-Methoxy-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 18C)**

**18C**

The title compound was prepared in the manner analogous to **Example 1F** using **1D** and **18B**. MS  $m/z$  478 ( $M+1$ ).

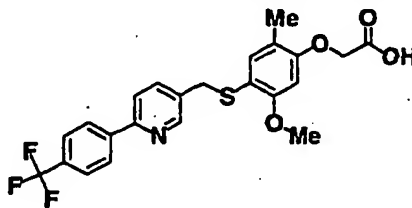
-80-

**Preparation of {5-Methoxy-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid (compound 18)**

The title compound was prepared from the product of Example 18C in the manner analogous to Example 1. mp 225 °C (dec.); 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 8.97 (s, 1H), 8.2 (dd, 1H, *J* = 2.4 Hz, *J* = 8.4 Hz), 8.13 (m, 1H), 8.01 (d, 2H, *J* = 8.4 Hz), 7.34 (s, 2H, *J* = 8.4 Hz), 6.95 (s, 1H), 6.42 (s, 1H), 4.23 (s, 2H), 4.01 (s, 2H), 3.69 (s, 3H), 1.96 (s, 3H) MS *m/z* 464 (M+1).

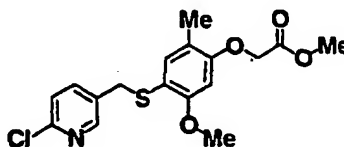
**Example 19**

**Synthesis of {5-Methoxy-2-methyl-4-[6-(4-trifluoromethyl-phenyl)-pyridin-3-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 19)**



19

**Step 1. Preparation of [4-(6-Chloro-pyridin-3-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid methyl ester (compound 19A)**

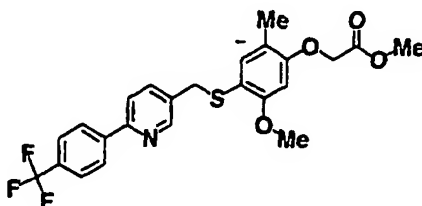


19A

The title compound was prepared from 2-Chloro-5-chloromethyl-pyridine and 1D in a manner analogous to Example 1F. MS *m/z* 370 (M+2).

-81-

**Step 2. Preparation of {5-Methoxy-2-methyl-4-[6-(4-trifluoromethyl-phenyl)-pyridin-3-ylmethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 19B)**

**19B**

The title compound was prepared from the product of Example 19A and 1-bromo-4-trifluoromethyl-benzene in a manner analogous to Example 3A. MS  $m/z$  478 (M+1).

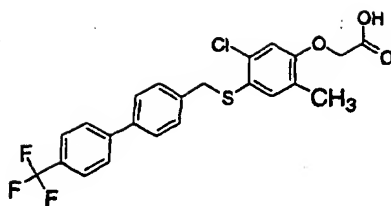
**Step 3. Preparation of {5-Methoxy-2-methyl-4-[6-(4-trifluoromethyl-phenyl)-pyridin-3-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 19)**

The title compound was prepared from the product of Example 19B in the manner analogous to Example 1. mp 203 °C (dec.); 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  8.34 (d, 1H,  $J = 1.6$  Hz), 8.21 (d, 2H,  $J = 8$  Hz), 7.92 (d, 1H,  $J = 8.4$  Hz), 7.77 (d, 2H,  $J = 8.4$  Hz), 7.65 (dd 1H,  $J = 2.4$  Hz,  $J' = 8.4$  Hz), 6.93 (s, 1H), 6.39 (s, 1H), 4.15 (s, 2H), 4.00 (s, 2H), 3.66 (s, 3H), 1.95 (s, 3H). MS  $m/z$  464 (M+1).

### Example 20

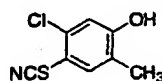
**Synthesis of [5-Chloro-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 20)**

-82-



20

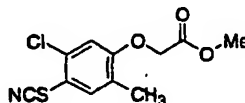
Step 1. Preparation of 5-Chloro-2-methyl-4-thiocyanato-phenol (compound  
5 20A)



20A

10 The title compound was prepared in a manner analogous to **Example 1B** from 5-chloro-2-methyl-phenol. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  10.60 (s, 1H), 7.54 (s, 1H), 6.98 (s, 1H), 2.07 (s, 3H).

Step 2. Preparation of (5-Chloro-2-methyl-4-thiocyanato-phenoxy)-acetic acid  
15 methyl ester (compound 20B)

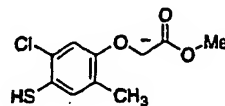


20B

20 The title compound was prepared from the product of **Example 20A** in a manner analogous to **Example 1C**. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.62 (s, 1H), 7.40 (s, 1H), 4.94 (s, 2H), 3.65 (s, 3H), 2.15 (s, 3H).

-83-

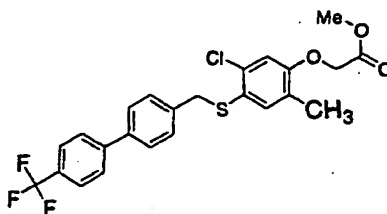
**Step 3. Preparation of (5-Chloro-4-mercapto-2-methyl-phenoxy)-acetic acid methyl ester (compound 20C)**



20C

The title compound was prepared from (5-chloro-2-methyl-4-thiocyanato-phenoxy)-acetic acid methyl ester in a manner analogous to **Example 1D**. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.27 (s, 1H), 6.97 (s, 1H), 5.31 (s, 1H), 4.79 (s, 2H), 3.64 (s, 3H), 2.07 (s, 3H).

**Step 4. Preparation of [5-Chloro-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 20D)**



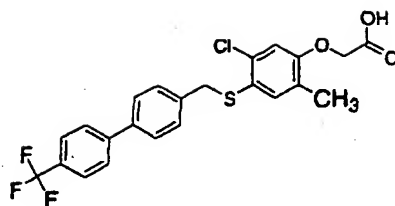
20D

The title compound was prepared in the manner analogous to **Example 1F** using **3B** and **20C**. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.82 (d, 2H,  $J = 8.3$  Hz), 7.74 (d, 2H,  $J = 8.3$  Hz), 7.62 (d, 2H,  $J = 8.3$  Hz), 7.39 (d, 2H,  $J = 8.3$  Hz), 7.27 (s, 1H), 7.00 (s, 1H), 4.82 (s, 2H), 4.20 (s, 2H), 3.64 (s, 3H), 2.09 (s, 3H); MS  $m/z$  480 (M $^+$ ).

**Step 5. Preparation of [5-Chloro-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 20)**



-84-



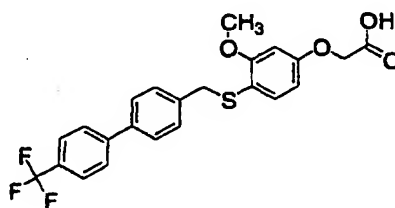
20

- 5 The title compound was prepared in the manner analogous to **Example 1** using **20D**. mp 161-162 °C; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.83 (d, 2H,  $J = 8.3$  Hz), 7.74 (d, 2H,  $J = 8.3$  Hz), 7.62 (d, 2H,  $J = 8.3$  Hz), 7.51 (d, 2H,  $J = 8.3$  Hz), 7.26 (s, 1H), 6.95 (s, 1H), 4.69 (s, 2H), 4.20 (s, 2H), 2.08 (s, 3H); MS  $m/z$  467 ( $M+1$ ).

10

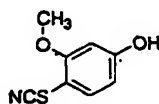
**Example 21**

**Synthesis of [3-Methoxy-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfanyl)-phenoxy]-acetic acid (compound 21)**



15

**Step 1. Preparation of 3-Methoxy-4-thiocyanato-phenol (compound 21A)**



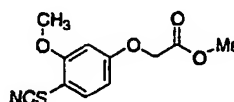
21A

20

-85-

The title compound was prepared in a manner analogous to **Example 1B** from 3-methoxy-phenol. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  10.21 (s, 1H), 7.34 (d, 1H,  $J = 8.3$  Hz), 6.53 (s, 1H), 6.43 (d, 1H,  $J = 8.3$  Hz), 3.81 (s, 3H).

5      **Step 2. Preparation of (3-Methoxy-4-thiocyanato-phenoxy)-acetic acid methyl ester (compound 21B)**

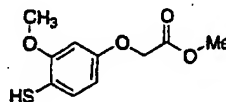


21B

10

The title compound was prepared from the product of **Example 21A** in a manner analogous to **Example 1C**. MS  $m/z$  227 (M-CN).

15      **Step 4. Preparation of (4-Mercapto-3-methoxy-phenoxy)-acetic acid methyl ester (compound 21C)**

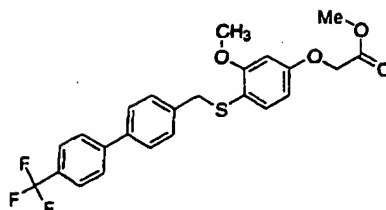


21C

20      The title compound was prepared from (3-Methoxy-4-thiocyanato-phenoxy)-acetic acid methyl ester in a manner analogous to **Example 1D**. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.13 (d, 1H,  $J = 8.5$  Hz), 6.56 (s, 1H), 6.39 (d, 1H,  $J = 8.5$  Hz), 4.72 (s, 2H), 4.51 (s, 1H), 3.75 (s, 3H), 3.64 (s, 3H).

25      **Step 5. Preparation of [3-Methoxy-4-(4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-phenoxy]-acetic acid methyl ester (compound 21D)**

-86-

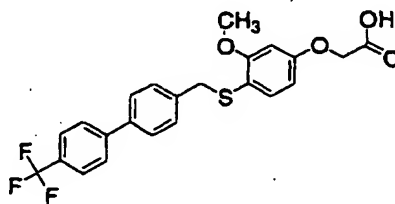


21D

5 The title compound was prepared in the manner analogous to **Example 1F** using **3B** and **21C**. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.81 (d, 2H,  $J = 8.3$  Hz), 7.53 (d, 2H,  $J = 8.3$  Hz), 7.59 (d, 2H,  $J = 8.3$  Hz), 7.32 (d, 2H,  $J = 8.3$  Hz), 7.11 (d, 1H,  $J = 8.5$  Hz), 6.56 (s, 1H), 6.37 (d, 1H,  $J = 8.5$  Hz), 4.73 (s, 2H), 4.04 (s, 2H), 3.76 (s, 3H), 3.63 (s, 3H); MS  $m/z$  463 ( $M+1$ ).

10

**Step 6. Preparation of [3-Methoxy-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 21)**



21

15

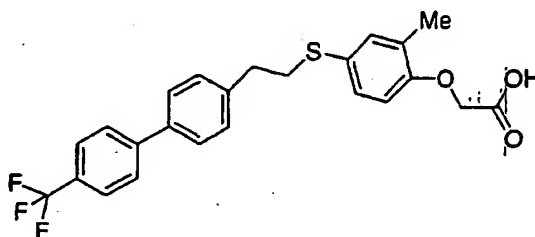
The title compound was prepared in the manner analogous to **Example 1** using **21D**. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.83 (d, 2H,  $J = 8.3$  Hz), 7.76 (d, 2H,  $J = 8.3$  Hz), 7.61 (d, 2H,  $J = 8.3$  Hz), 7.34 (d, 2H,  $J = 8.3$  Hz), 7.13 (d, 1H,  $J = 8.5$  Hz), 6.56 (s, 1H), 6.39 (d, 1H,  $J = 8.5$  Hz), 4.63 (s, 2H), 4.06 (s, 2H), 3.77 (s, 3H); MS  $m/z$  449 ( $M+1$ ). Anal. Calc'd for  $\text{C}_{23}\text{H}_{19}\text{F}_3\text{O}_4\text{S}$ , C, 61.60; H, 4.27; found: C, 61.35; H, 4.25.

20

-87-

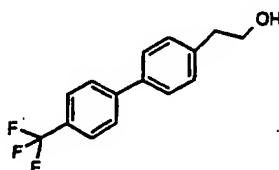
## Example 22

5     Synthesis of [2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-  
phenoxy]-acetic acid (compound 22)



22

10     **Step 1. Preparation of 2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethanol (compound 22A)**



22A

15

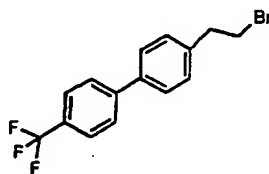
A mixture of 2-(4-bromo-phenyl)-ethanol (2.3 ml, 3.3 g, 16.4 mmol), 4-trifluoromethylphenylboronic acid (5.0 g, 26.3 mmol), 1.0 M aqueous sodium carbonate solution (44.0 ml), and tetrakis(triphenylphosphine)palladium (0.98 g, 0.85 mmol) in 180 ml of ethanol and 180 ml of toluene was heated at reflux for 4 h. The cooled reaction mixture was diluted with 500 ml of ethyl acetate and filtered through a bed of Celite filter-aid. The filtrate was washed with 5% aqueous sodium carbonate solution (2x750 ml) and brine (3x750 ml), then dried over anhydrous sodium sulfate

20

-88-

and concentrated. The crude product was purified by normal phase chromatography. MS  $m/z$  266 (M).

**Step 2. Preparation of 4-(2-Bromo-ethyl)-4'-trifluoromethyl-biphenyl**  
(compound 22B)

**22B**

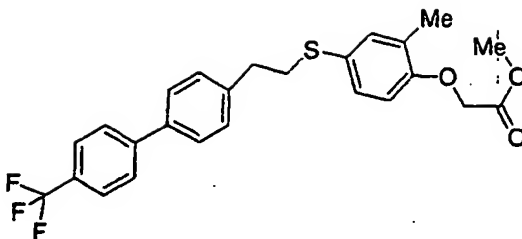
10 A solution of 2-(4'-trifluoromethyl-biphenyl-4-yl)-ethanol (2.8 g, 10.3 mmol) and carbon tetrabromide (3.8 g, 11.5 mmol) in 50 ml of dichloromethane was cooled in ice, and triphenylphosphine (2.9 g, 11.1 mmol) was added in portions over 10 minutes. The mixture was stirred at room temperature for 18 h, and the solvent was evaporated. The residue was stirred in 75 ml of ether, and the mixture was filtered.

15 The insoluble material was washed on the funnel with fresh ether (3x75 ml). The combined ether filtrates were concentrated, and the crude product was purified by normal phase chromatography. MS  $m/z$  328 (M-1).

**Step 3. Preparation of {2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 22C)**

20

-89-



22C

A solution 4-(2-bromo-ethyl)-4'-trifluoromethyl-biphenyl (0.66 g, 2.0 mmol) and (4-  
 mercapto-2-methyl-phenoxy)-acetic acid methyl ester (0.42 g, 2.0 mmol) in 10 ml of  
 acetonitrile was treated with cesium carbonate (1.3 g, 4.0 mmol), and the mixture was  
 stirred at room temperature for 18 h. The reaction mixture was added to 200 ml of  
 brine and extracted with ethyl acetate (4x75 ml). The combined extracts were washed  
 with brine (2x200 ml), then dried over anhydrous sodium sulfate and concentrated.  
 The crude product was purified by normal phase chromatography. MS  $m/z$  461  
 (M+1).

**Step 4. Preparation of {2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid (compound 22)**

A solution of {2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-  
 phenoxy}-acetic acid methyl ester (0.78 g, 1.7 mmol) in 10 ml of tetrahydrofuran and  
 2.0 ml of water was treated with lithium hydroxide monohydrate (0.21 g, 5.0 mmol),  
 and the mixture was stirred at room temperature for 2 h. The reaction mixture was  
 diluted with 5.0 ml of water and made strongly acidic by the addition of 4.0 N  
 hydrochloric acid. The mixture was extracted with ethyl acetate (4x30 ml), and the  
 combined extracts were washed with brine (2x50 ml), then dried over anhydrous  
 sodium sulfate and concentrated. The crude product was recrystallized from ethyl  
 acetate/hexane. mp 132-134 °C; IR (thin film)  $\text{cm}^{-1}$ : 1741, 1709, 1490, 1326, 1239,  
 1110; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.82 (d, 2H,  $J = 8.0$  Hz), 7.74 (d, 2H,  $J = 8.0$

-90-

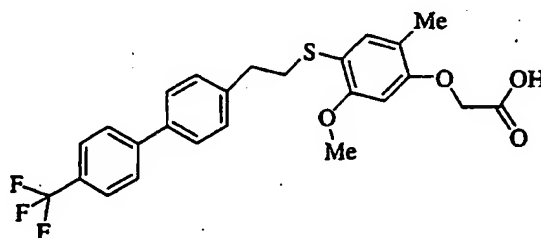
Hz), 7.61 (d, 2H,  $J = 8.3$  Hz), 7.31 (d, 2H,  $J = 8.3$  Hz), 7.15 (m, 2H), 6.75 (d, 1H,  $J = 8.3$  Hz), 4.64 (s, 2H), 3.11 (t, 2H,  $J = 7.6$  Hz), 2.82 (t, 2H,  $J = 7.6$  Hz), 2.12 (s, 3H); MS  $m/z$  447 (M+1). Anal. Calc'd for  $C_{24}H_{21}F_3O_3S$ : C, 64.56; H, 4.74; found: C, 64.45; H, 4.58.

5

### Example 23

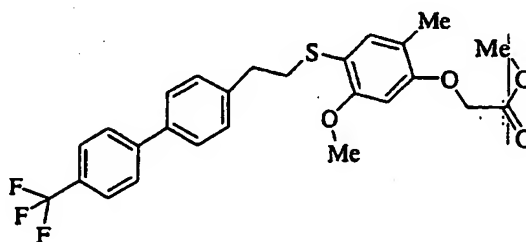
#### Synthesis of {5-Methoxy-2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid (compound 23)

10



#### Step 1. Preparation of {5-Methoxy-2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 23A)

15

**23A**

20

The title compound was prepared in the manner analogous to **Example 22C** using 4-(2-bromo-ethyl)-4'-trifluoromethyl-biphenyl and **1D**. MS  $m/z$  491 (M+1).

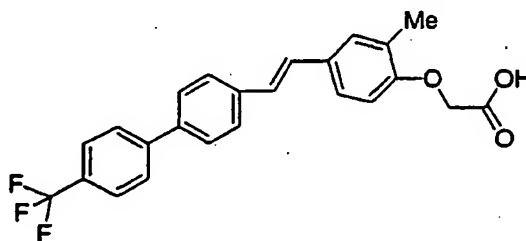
-91-

**Step 2. Preparation of {5-Methoxy-2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid (compound 23)**

5 The title compound was prepared in the manner analogous to **Example 1** using {5-methoxy-2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid methyl ester. mp 169-171 °C; IR (thin film)  $\text{cm}^{-1}$ : 1718, 1500, 1330, 1162, 1109, 1052; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.82 (d, 2H,  $J = 8.3$  Hz), 7.74 (d, 2H,  $J = 8.6$  Hz), 7.61 (d, 2H,  $J = 8.3$  Hz), 7.31 (d, 2H,  $J = 8.3$  Hz), 7.06 (s, 1H), 6.53 (s, 1H), 4.69 (s, 2H), 3.73 (s, 3H), 3.02 (t, 2H,  $J = 7.5$  Hz), 2.78 (t, 2H,  $J = 7.5$  Hz), 2.06 (s, 3H); MS  $m/z$  477 ( $M+1$ ). Anal. Calc'd for  $\text{C}_{25}\text{H}_{23}\text{F}_3\text{O}_4\text{S}$ : C, 63.02; H, 4.87; found: C, 62.77; H, 4.62.

**Example 24**

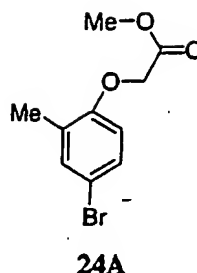
**Synthesis of {2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-vinyl]-phenoxy}-acetic acid (compound 24)**



**Step 1. Preparation of (4-Bromo-2-methyl-phenoxy)-acetic acid methyl ester (compound 24A)**



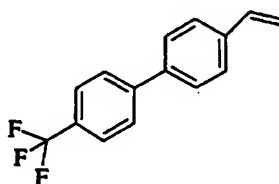
-92-



5 A solution of o-tolyloxy-acetic acid methyl ester (Belleney J., et al., *J. Heterocyclic Chem.*, 1984; 21:1431; 3.7 g, 20.5 mmol) in 70 ml of acetonitrile was treated in portions over 10 minutes with *N*-bromosuccinimide (3.8 g, 21.3 mmol). The mixture was stirred at room temperature for 18 h, and the solvent was evaporated. The residue was stirred in 75 ml of carbon tetrachloride, and the mixture was filtered. The insoluble material was washed on the funnel with fresh carbon tetrachloride (2x50 ml). The combined filtrates were concentrated, and the crude product was purified by normal phase chromatography. MS *m/z* 258 (M-1).

**Step 2. Preparation of 4-Trifluoromethyl-4'-vinyl-biphenyl (compound 24B)**

15



20 The title compound was prepared in the manner analogous to Example 3A using 1-bromo-4-vinyl-benzene and 4-trifluoromethylphenylboronic acid. MS *m/z* 248 (M).

-93-

**Step 3. Preparation of {2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-vinyl]-phenoxy}-acetic acid methyl ester and {2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-vinyl]-phenoxy}-acetic acid (compound 24)**

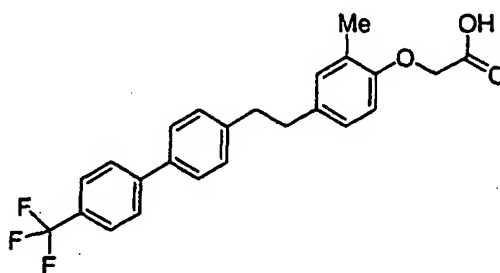
5 A mixture of 4-trifluoromethyl-4'-vinyl-biphenyl (1.9 g, 7.7 mmol), (4-Bromo-2-methyl-phenoxy)-acetic acid methyl ester (2.0 g, 7.7 mmol), anhydrous sodium acetate (1.2 g, 14.6 mmol), *N,N*-dimethylglycine (0.23 g, 2.2 mmol), and palladium acetate (0.025 g, 0.11 mmol) in 10 ml of 1-methyl-pyrrolidin-2-one was heated at 130 °C for 10 h. The reaction mixture was partitioned between 250 ml of brine and 300  
10 ml of ethyl acetate. The total mixture was filtered through a bed of Celite filter-aid. The organic layer was washed with 5% aqueous sodium carbonate solution (3x250 ml) and brine (2x250 ml), then dried over anhydrous sodium sulfate and concentrated. The residue was purified by normal phase chromatography to give {2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-vinyl]-phenoxy}-acetic acid methyl ester; MS *m/z*  
15 427 (M+1).

During the above sodium carbonate washings, a precipitate formed and was removed by filtration. The solid was stirred for 18 h in a solution of 150 ml of water, 50 ml of methanol, and 50 ml of 4.0 N hydrochloric acid. The acidified product was filtered and recrystallized from aqueous acetonitrile to give {2-methyl-4-[2-(4'-  
20 trifluoromethyl-biphenyl-4-yl)-vinyl]-phenoxy}-acetic acid. mp 243-245 °C; IR (thin film)  $\text{cm}^{-1}$ : 1746, 1717, 1502, 1323, 1125, 1069; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.88 (d, 2H,  $J = 8.0$  Hz), 7.76 (d, 2H,  $J = 8.3$  Hz), 7.71 (d, 2H,  $J = 8.5$  Hz), 7.64 (d, 2H,  $J = 8.5$  Hz), 7.43 (d, 1H,  $J = 1.7$  Hz), 7.32 (dd, 1H,  $J = 2.1, 8.5$  Hz), 7.21 (d, 1H,  $J = 16.5$  Hz), 7.10 (d, 1H,  $J = 16.4$  Hz), 6.79 (d, 1H,  $J = 8.5$  Hz), 4.68 (s, 2H), 2.18 (s,  
25 3H); MS *m/z* 413 (M+1). Anal. Calc'd for  $\text{C}_{24}\text{H}_{19}\text{F}_3\text{O}_3$ : C, 69.90; H, 4.64; found: C, 69.77; H, 4.57.

-94-

## Example 25

Synthesis of {2-Methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethyl]-phenoxy}-acetic acid (compound 25)



25

10 A solution of {2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-vinyl]-phenoxy}-acetic acid (0.98 g, 2.4 mmol) in 100 ml of tetrahydrofuran was hydrogenated over 0.16 g of 20% palladium on carbon catalyst. The catalyst was removed by filtration, and the filtrate was evaporated. The crude product was recrystallized from aqueous acetonitrile. mp 174-176 °C; IR (thin film)  $\text{cm}^{-1}$ : 1747, 1711, 1500, 1318, 1160, 1123;

15 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.83 (d, 2H,  $J = 8.1$  Hz), 7.74 (d, 2H,  $J = 8.3$  Hz), 7.60 (d, 2H,  $J = 6.5$  Hz), 7.32 (d, 2H,  $J = 8.3$  Hz), 7.01 (d, 1H,  $J = 2.0$  Hz), 6.94 (dd, 1H,  $J = 2.0, 8.3$  Hz), 6.66 (d, 1H,  $J = 8.3$  Hz), 4.59 (s, 2H), 2.83 (m, 2H), 2.76 (m, 2H), 2.11 (s, 3H); MS  $m/z$  413 (M-1). Anal. Calc'd for  $\text{C}_{24}\text{H}_{21}\text{F}_3\text{O}_3$ : C, 69.56; H, 5.11; found: C, 69.28; H, 4.96.

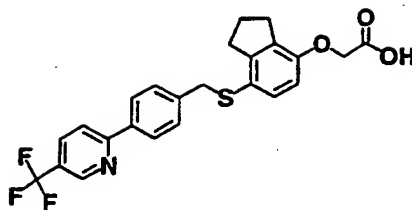
20

## Example 26

Synthesis of {7-[4-(5-Trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 26)

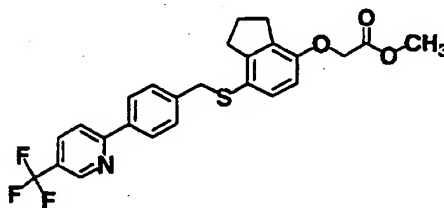
25

-95-



26

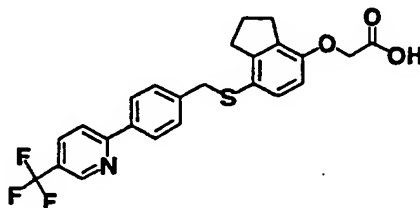
Step 1. Preparation of {7-[4-(5-Trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 26A)



26A

The title compound was prepared in the manner analogous to Example 1F using 18B and 12C. MS  $m/z$  474 (M+1).

Step 2. Preparation of {7-[4-(5-Trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 26)



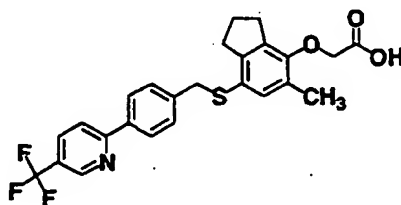
26

-96-

The title compound was prepared from the product of Example 26A in the manner analogous to Example 1. mp 220 °C (dec.); 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 12.94 (s, 1H), 8.97 (s, 1H), 8.2 (dd, 1H, *J* = 2 Hz, *J'* = 8.8 Hz), 8.13 (d, 1H, *J* = 8.4 Hz), 8.01 (d, 2H, *J* = 8.4 Hz), 7.34 (d, 2H, *J* = 8.8 Hz), 7.07 (d, 1H, *J* = 8.4 Hz), 6.57 (d, 1H, *J* = 8 Hz), 4.61 (s, 2H), 4.07 (s, 2H), 2.72 (m, 4H), 1.89 (m, 2H). MS *m/z* 460 (M+1).

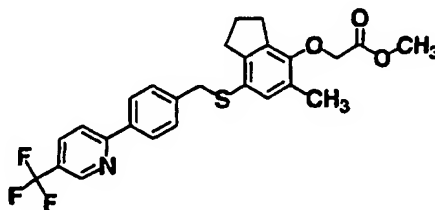
### Example 27

#### Synthesis of {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 27)



27

#### **Step 1. Preparation of {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 27A)**



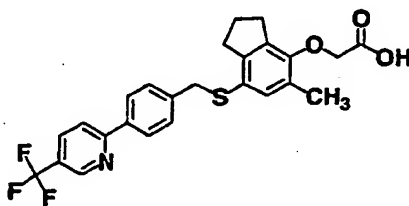
27A

-97-

The title compound was prepared from the products of Example 18B and (7-mercapto-5-methyl-indan-4-yloxy)-acetic acid methyl ester (prepared in a similar manner as described for Example 12C) in a manner analogous to Example 1F. MS  $m/z$  488 (M+1).

5

**Step 2. Preparation of {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 27)**



27

10

The title compound was prepared from the product of Example 27A in the manner analogous to Example 1. mp 186 °C ; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.94 (s, 1H), 8.97 (s, 1H), 8.24 (dd, 1H,  $J = 2$  Hz,  $J' = 8.8$  Hz), 8.14 (d, 1H,  $J = 8.4$  Hz), 8.01 (d, 2H,  $J = 8.4$  Hz), 7.34 (d, 2H,  $J = 8.8$  Hz), 6.99 (s, 1H), 4.41 (s, 2H), 4.13 (s, 2H), 2.83 (t, 2H,  $J = 7.2$  Hz), 2.62 (t, 2H,  $J = 7.2$  Hz), 2.13 (s, 3H), 1.87 (m, 2H). MS  $m/z$  474 (M+1).

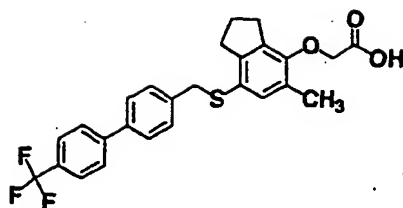
15

### Example 28

20

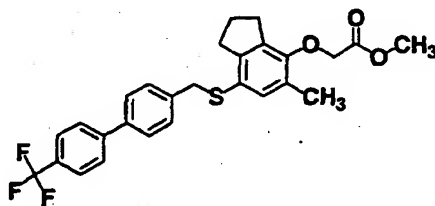
**Synthesis of [5-Methyl-7-(4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-indan-4-yloxy]-acetic acid (compound 28)**

-98-



28

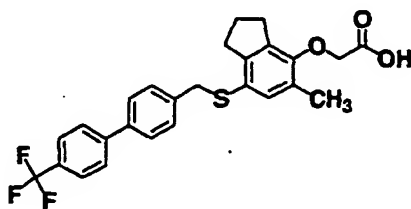
Step 1. Preparation of [5-Methyl-7-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid methyl ester (compound 28A)



28A

The title compound was prepared from the product of Example 3B and (7-Mercapto-5-methyl-indan-4-yloxy)-acetic acid methyl ester in a manner analogous to Example 1F. MS  $m/z$  487 (M+1).

Step 2. Preparation of [5-Methyl-7-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid (compound 28)



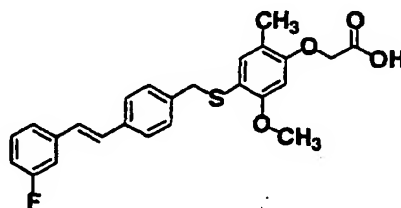
28

-99-

The title compound was prepared from the product of Example 28A in the manner analogous to Example 1. mp 177 °C; 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 12.82 (s, 1H), 7.82 (d, 2H, *J* = 8 Hz), 7.75 (d, *J* = 8 Hz), 7.61 (d, 2H, *J* = 8 Hz), 7.35 (d, 2H, *J* = 8 Hz), 6.99 (s, 1H), 4.41 (s, 2H), 4.12 (s, 2H), 2.83 (t, 2H, *J* = 7.2 Hz), 2.62 (t, 2H, *J* = 7.2 Hz), 2.13 (s, 3H), 1.89 (m, 2H). MS *m/z* 473 (M+1).

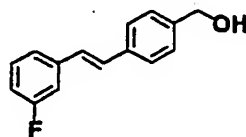
### Example 29

Synthesis of (4-[4-[2-(3-Fluoro-phenyl)-vinyl]-benzylsulfanyl]-5-methoxy-2-methyl-phenoxy)-acetic acid (compound 29)



29

Step 1. Preparation of (4-[2-(3-Fluoro-phenyl)-vinyl]-phenyl)-methanol (compound 29A)



29A

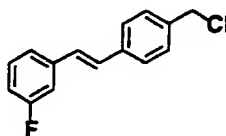
(4-Bromo-phenyl)-methanol (1g, 5.35 mmol), 3-fluorostyrene (718 mg, 5.89 mmol), palladium acetate (60 mg, 0.3 mmol), and triphenylphosphine (140 mg, 0.6 mmol) were heated in triethylamine at 90 °C in a sealed tube for 18h. The reaction was



-100-

concentrated and purified by normal phase chromatography to afford the title compound. MS  $m/z$  227 (M-1).

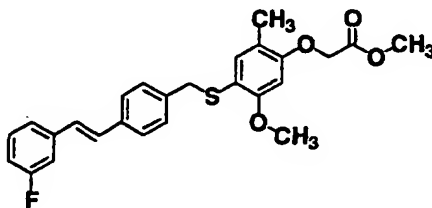
Step 2. Preparation of {4-[2-(3-Fluoro-phenyl)-vinyl]-phenyl}-chloromethane  
(compound 29B)



29B

The title compound was prepared from the product of Example 29A in a manner analogous to Example 3B. MS  $m/z$  245 (M-1).

Step 3. Preparation of (4-{4-[2-(3-Fluoro-phenyl)-vinyl]-benzylsulfanyl}-5-methoxy-2-methyl-phenoxy)-acetic acid methyl ester (compound 29C)

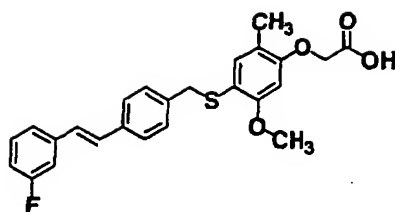


29C

The title compound was prepared from the product of Example 29B and the product of Example 1D in a manner analogous to Example 1F. MS  $m/z$  453 (M+1).

Step 4. Preparation of (4-{4-[2-(3-Fluoro-phenyl)-vinyl]-benzylsulfanyl}-5-methoxy-2-methyl-phenoxy)-acetic acid (compound 29)

-101-

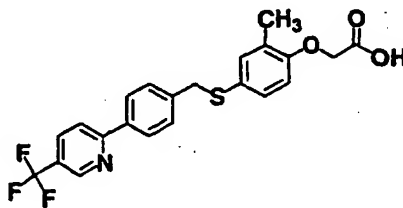


29

The title compound was prepared from the product of Example 29C in the manner analogous to Example 1. mp 154 °C (dec.); 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 12.94 (s, 1H), 7.46-7.34 (m, 5H), 7.27-7.15 (m, 4H), 7.06-6.99 (m, 2H), 6.52 (s, 1H), 4.69 (s, 2H), 3.98 (s, 2H), 3.73 (s, 3H), 2.00 (s, 3H), MS *m/z* 439 (*M*+1).

### Example 30

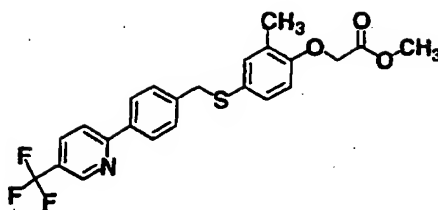
Synthesis of {2-Methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid (compound 30)



30

**Step 1. Preparation of {2-Methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 30A)**

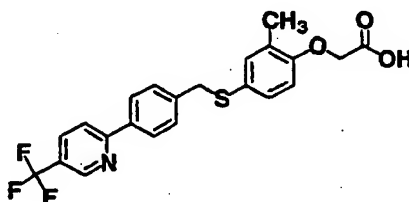
-102-



30A

The title compound was prepared from the product of Example 2C and the product of Example 18B in a manner analogous to Example 1F. MS  $m/z$  448 (M+1).

**Preparation of {2-Methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid**



30

10

The title compound was prepared from the product of Example 30A in the manner analogous to Example 1. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  8.97 (s, 1H), 8.2 (dd, 1H,  $J = 2$  Hz,  $J' = 8.8$  Hz), 8.13 (d, 1H,  $J = 8.4$  Hz), 8.01 (d, 2H,  $J = 8.4$  Hz), 7.36 (d, 2H,  $J = 8.4$  Hz), 7.07 (s, 1H), 7.01 (dd, 1H,  $J = 8.4$  Hz,  $J' = 2.4$  Hz), 6.57 (d, 1H,  $J = 8.8$  Hz), 4.09 (s, 2H), 4.06 (s, 2H), 2.04 (s, 3H). MS  $m/z$  434 (M+1).

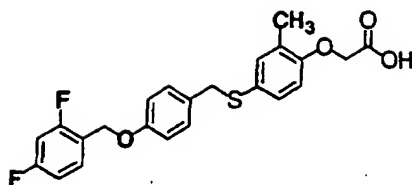
15

**Example 31**

**Synthesis of {4-[4-(2,4-Difluoro-benzoyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 31)**

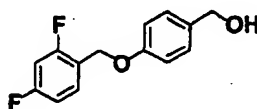
20

-103-



31

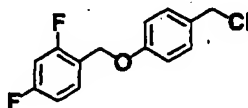
Step 1. Preparation of [4-(2,4-Difluoro-benzyl)oxy]-phenyl]-methanol  
(compound 31A)



31A

The title compound was prepared in the manner analogous to **Example 14A** using 1-bromomethyl-2,4-difluoro-benzene and 4-hydroxymethyl-phenol. MS  $m/z$  233 (M-OH).

Step 2. Preparation of 1-(4-Chloromethyl-phenoxy)methyl)-2,4-difluoro-benzene  
(compound 31B)

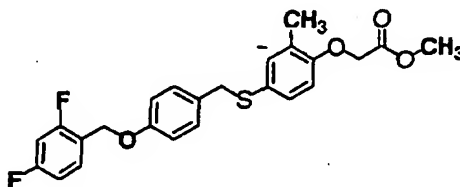


31B

The title compound was prepared in the manner analogous to **Example 3B** using 31A. MS  $m/z$  233 (M-Cl).

-104-

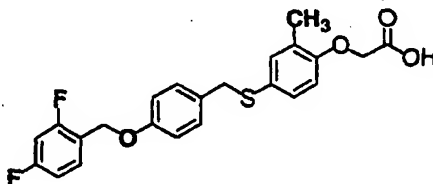
**Step 3. Preparation of {4-[4-(2,4-Difluoro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid methyl ester (compound 31C)**



31C

The title compound was prepared in the manner analogous to **Example 1F** using **31B** and **2C**. MS  $m/z$  445 ( $M+1$ ).

**Step 4. Preparation of {4-[4-(2,4-Difluoro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid**



31

To a solution of the product from **Example 31C** (1.5 g, 3.3 mmol) in a mixture of 20 mL of tetrahydrofuran and 4 mL of water was added lithium hydroxide monohydrate (0.42 g, 9.9 mmol). The reaction mixture was stirred at room temperature for 18 hrs and then evaporated to afford a residue, which was suspended in 50 mL of water.

The mixture was acidified with 1N hydrochloric acid to pH 2. The precipitated solid was collected by filtration, washed with water, and then dried to provide the title compound without any further purification. mp 139-141 °C; IR (KBr)  $\text{cm}^{-1}$ : 3081, 2917, 1735, 1604, 1508, 1233; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ ):  $\delta$  7.51-7.59 (m, 1H),

-105-

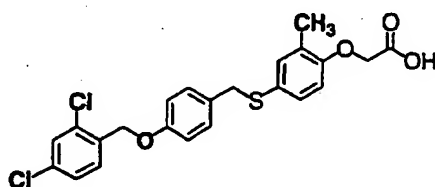
7.02-7.31 (m, 6H), 6.85-6.92 (m, 2H), 6.68 (d, 1H,  $J = 8.6$  Hz), 5.01 (s, 2H), 4.60 (s, 2H), 4.00 (s, 2H), 2.08 (s, 3H); MS  $m/z$  429 (M-1). Anal. Calc'd for  $C_{23}H_{20}F_2O_4S$ : C, 64.17; H, 4.68; found: C, 64.11; H, 4.59.

5

**Example 32**

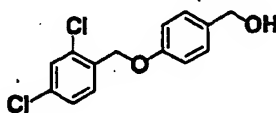
Synthesis of [4-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy]-acetic acid (compound 32)

10

**32**

**Step 1. Preparation of [4-(2,4-Dichloro-benzyloxy)-phenyl]-methanol (compound 32A)**

15

**32A**

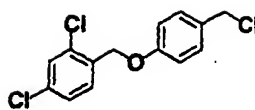
The title compound was prepared in the manner analogous to **Example 14A** using 2,4-dichloro-1-chloromethyl-benzene and 4-hydroxymethyl-phenol. MS  $m/z$  265 (M-OH).

20

**Step 2. Preparation of 2,4-Dichloro-1-(4-chloromethyl-phenoxy)methyl)-benzene (compound 32B)**

25

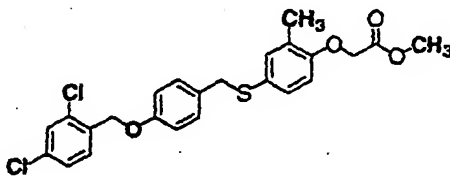
-106-



32B

5 The title compound was prepared in the manner analogous to Example 3B using 32A. MS  $m/z$  265 (M-Cl).

Step 3. Preparation of {4-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid methyl ester (compound 32C)



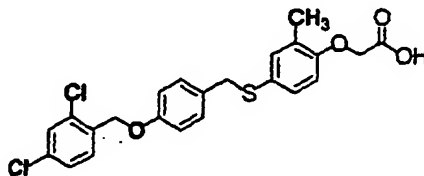
32C

10

The title compound was prepared in the manner analogous to Example 1F using 32B and 2C. MS  $m/z$  477 (M+1).

15

Step 4. Preparation of {4-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 32)



32

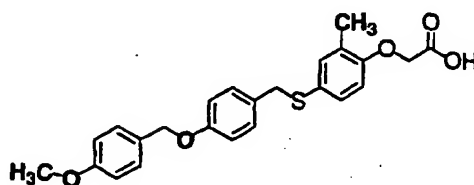
20

-107-

The title compound was prepared in the manner analogous to Example 1 using 32C. mp 143-145 °C; IR (KBr)  $\text{cm}^{-1}$ : 3062, 2936, 1724, 1492, 1227, 1192; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.97 (br(s), 1H), 7.64 (d, 1H,  $J = 2.0$  Hz), 7.54 (d, 1H,  $J = 8.3$  Hz), 7.42 (dd, 1H,  $J = 8.3, 2.0$  Hz), 7.01-7.20 (m, 4H), 6.84-6.92 (m, 2H), 6.69 (d, 1H,  $J = 8.5$  Hz), 5.05 (s, 2H), 4.62 (s, 2H), 4.01 (s, 2H), 2.08 (s, 3H); MS  $m/z$  461 (M-1). Anal. Calc'd for  $\text{C}_{23}\text{H}_{20}\text{Cl}_2\text{O}_4\text{S}$ : C, 59.62; H, 4.35; found: C, 59.33; H, 4.28.

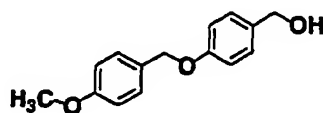
### Example 33

#### Synthesis of [4-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy]-acetic acid (compound 33)



33

#### Step 1. Preparation of [4-(4-Methoxy-benzyloxy)-phenyl]-methanol (compound 33A)



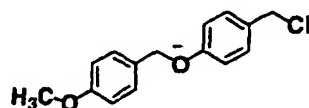
33A

The title compound was prepared in the manner analogous to Example 14A using 1-chloromethyl-4-methoxy-benzene and 4-hydroxymethyl-phenol. MS  $m/z$  227 (M-OH).



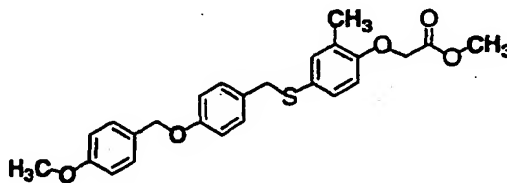
-108-

**Step 2. Preparation of 4-Methoxy-1-(4-chloromethyl-phenoxy)methyl)-benzene (compound 33B)**

**33B**

The title compound was prepared in the manner analogous to **Example 3B** using **33A**. MS  $m/z$  227 (M-Cl).

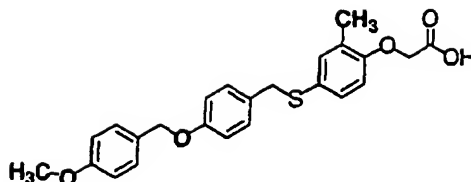
**Step 3. Preparation of {4-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid methyl ester (compound 33C)**

**33C**

The title compound was prepared in the manner analogous to **Example 1F** using **33B** and **2C**. MS  $m/z$  439 (M+1).

**Step 4. Preparation of {4-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 33)**

-109-

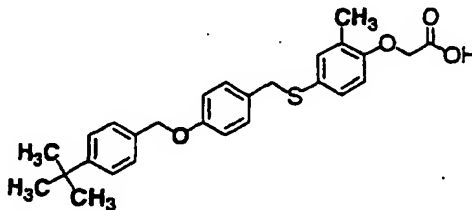


33

- 5 The title compound was prepared in the manner analogous to **Example 1** using **33C**.  
 mp 150-152 °C; HPLC: area % = 96.69, r.t. = 2.93 min.,  $\gamma$  = 214 nm, mobile phase =  
 acetonitrile/water with 0.10% TFA; IR (KBr)  $\text{cm}^{-1}$ : 2929, 1728, 1707, 1513, 1491,  
 1225; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ ):  $\delta$  12.98 (br(s), 1H), 7.27-7.34 (m, 2H), 7.02-  
 7.16 (m, 4H), 6.81-6.91 (m, 4H), 6.69 (d, 1H,  $J$  = 8.6 Hz), 4.91 (s, 2H), 4.61 (s, 2H),  
 10 3.99 (s, 2H), 3.69 (s, 3H), 2.08 (s, 3H); MS  $m/z$  423 (M-1). Anal. Calc'd for  
 $\text{C}_{24}\text{H}_{24}\text{O}_5\text{S}$ : C, 67.90; H, 5.70; found: C, 67.48; H, 5.59.

### Example 34

- 15 Synthesis of [4-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy]-acetic acid (compound 34)

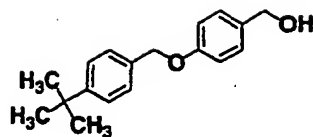


34

20

Step 1. Preparation of [4-(4-tert-Butyl-benzyloxy)-phenyl]-methanol  
 (compound 34A)

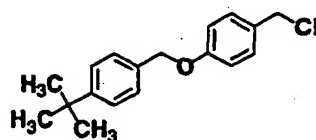
-110-



34A

The title compound was prepared in the manner analogous to Example 14A using 1-bromomethyl-4-tert-butyl-benzene and 4-hydroxymethyl-phenol. MS  $m/z$  253 (M-OH).

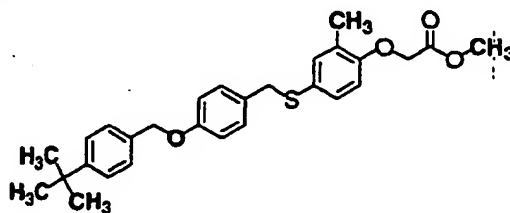
Step 2. Preparation of 4-tert-Butyl-1-(4-chloromethyl-phenoxy)methyl-benzene (compound 34B)



34B

The title compound was prepared in the manner analogous to Example 3B using 34A. MS  $m/z$  253 (M-Cl).

Step 3. Preparation of {4-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid methyl ester (compound 34C)

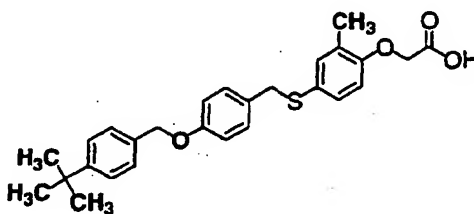


34C

-111-

The title compound was prepared in the manner analogous to **Example 1F** using **34B** and **2C**. MS  $m/z$  465 ( $M+1$ ).

5     **Step 4. Preparation of {4-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 34)**

**34**

10

The title compound was prepared in the manner analogous to **Example 1** using **34C**. mp 135-137 °C; IR (KBr)  $\text{cm}^{-1}$ : 2961, 2908, 1751, 1495, 1233, 1194; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  13.00 (br(s), 1H), 7.27-7.38 (m, 4H), 7.02-7.17 (m, 4H), 6.82-6.88 (m, 2H), 6.69 (d, 1H,  $J = 8.5$  Hz), 4.96 (s, 2H), 4.61 (s, 2H), 3.99 (s, 2H), 2.08 (s, 3H), 1.22 (s, 9H); MS  $m/z$  451 ( $M+1$ ). Anal. Calc'd for  $\text{C}_{27}\text{H}_{30}\text{O}_4\text{S}$ : C, 71.97; H, 6.71; found: C, 71.66; H, 6.52.

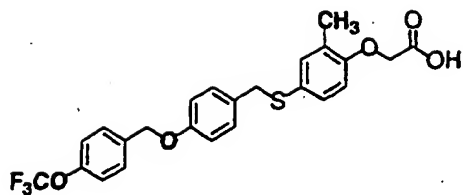
15

**Example 35**

20

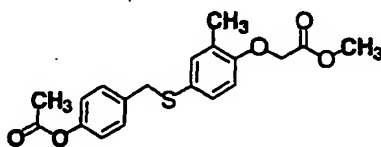
**Synthesis of {2-Methyl-4-[4-(4-trifluoromethoxy-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 35)**

-112-



35

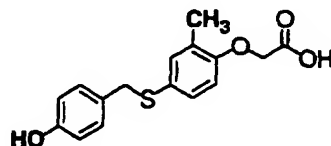
**Step 1. Preparation of [4-(4-Acetoxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid methyl ester (compound 35A)**



**35A**

10 The title compound was prepared in the manner analogous to **Example 1F** using acetic acid 4-chloromethyl-phenyl ester and **2C**. MS *m/z* 361 (M+1).

**Step 2. Preparation of [4-(4-Hydroxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid (compound 35B)**

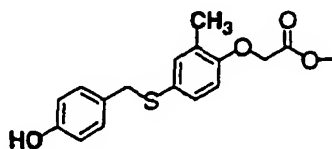


**35B**

The title compound was prepared in the manner analogous to Example 1 using 35A.  
MS  $m/z$  303 (M-1).

-113-

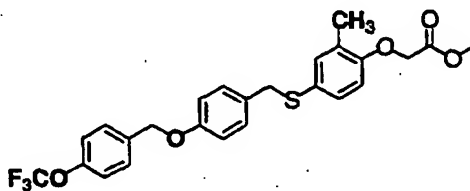
**Step 3. Preparation of [4-(4-Hydroxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid methyl ester (compound 35C)**



35C

To a solution of the product from Example 35B (0.43 g, 1.4 mmol) in 14 mL of 2,2-dimethoxy propane was added 1.4 mL of concentrated hydrochloric acid. The reaction mixture was stirred at room temperature for 18 hours. The mixture was concentrated and purified by flash chromatography to provide the title compound. MS *m/z* 317 (M-1).

**Step 4. Preparation of {2-Methyl-4-[4-(4-trifluoromethoxy-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 35D)**

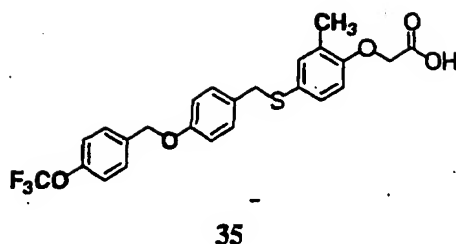


35D

The title compound was prepared in the manner analogous to Example 1F using 1-bromomethyl-4-trifluoromethoxy-benzene and 35C. MS *m/z* 493 (M+1).

**Step 5. Preparation of {2-Methyl-4-[4-(4-trifluoromethoxy-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 35)**

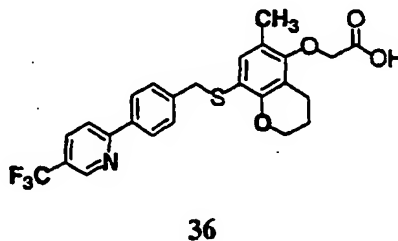
-114-



The title compound was prepared in the manner analogous to **Example 1** using **35D**.  
 mp 141-142 °C; 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>): δ 12.96 (br(s), 1H), 7.46-7.57 (m, 2H), 7.28-7.38 (m, 2H), 7.00-7.20 (m, 4H), 6.82-6.91 (m, 2H), 6.69 (d, 1H, *J* = 8.6 Hz), 5.05 (s, 2H), 4.62 (s, 2H), 4.00 (s, 2H), 2.08 (s, 3H); MS *m/z* 477 (M-1). Anal. Calc'd for C<sub>24</sub>H<sub>21</sub>F<sub>3</sub>O<sub>5</sub>S: C, 60.25; H, 4.42; found: C, 59.92; H, 4.07.

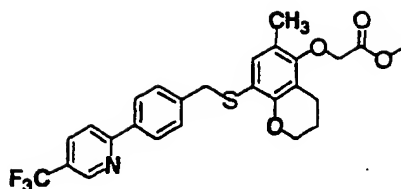
### Example 36

Synthesis of {6-Methyl-8-[4-(5-trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 36)



**Step 1.** {6-Methyl-8-[4-(5-trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 36A)

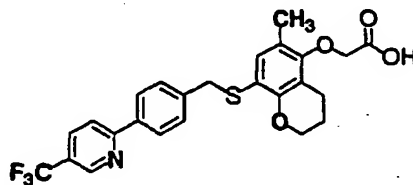
-115-



36A

The title compound was prepared in the manner analogous to **Example 1F** using (8-mercapto-6-methyl-chroman-5-yloxy)-acetic acid methyl ester and **18B**. MS  $m/z$  504 (M+1).

**Step 2.** {6-Methyl-8-[4-(5-trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 36)



36

The title compound was prepared in the manner analogous to **Example 1** using **36A**. mp 156-157 °C; IR (KBr)  $\text{cm}^{-1}$ : 2928, 1731, 1710, 1603, 1329, 1113, 1082; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.84 (br(s), 1H), 8.97 (s, 1H), 8.22 (dd, 1H,  $J = 8.4$ , 2.0 Hz), 8.12 (d, 1H,  $J = 8.4$  Hz), 8.04 (d, 2H,  $J = 8.2$  Hz), 7.42 (d, 2H,  $J = 8.2$  Hz), 6.88 (s, 1H), 4.29 (s, 2H), 4.05-4.14 (m, 4H), 2.64 (t, 2H,  $J = 6.3$  Hz), 2.04 (s, 3H), 1.81 (pentet, 2H); MS  $m/z$  490 (M+1). Anal. Calc'd for  $\text{C}_{25}\text{H}_{22}\text{F}_3\text{NO}_4\text{S}$ : C, 61.34; H, 4.53; N, 2.86; found: C, 60.96; H, 4.48; N, 2.79.

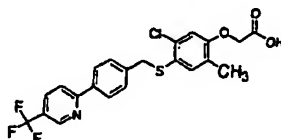


-116-

## Example 37

Synthesis of {5-Chloro-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid (compound 37)

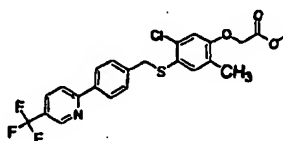
5



37

**Step 1. Preparation of {5-Chloro-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 37A)**

10



37A

15 Compound 37A was prepared in the manner analogous to Example 1F using the products from Example 18B and Example 20C. MS  $m/z$  482 ( $M^+$ ).

**Step 2. Preparation of {5-chloro-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy}-acetic acid (compound 37)**

20

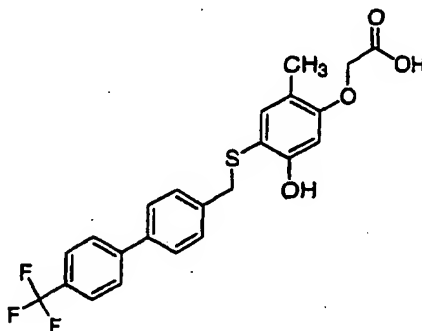
The title compound was prepared in the manner analogous to Example 1 using 37A. IR  $\text{cm}^{-1}$ : 1708, 1122; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  8.97 (s, 1H), 8.22 (d, 1H,  $J$  = 8.3 Hz), 8.12 (d, 1H,  $J$  = 8.3 Hz), 8.04 (d, 2H,  $J$  = 8.3 Hz), 7.43 (d, 2H,  $J$  = 8.3 Hz), 7.25 (s, 1H), 6.94 (s, 1H), 4.70 (s, 2H), 4.21 (s, 2H), 2.06 (s, 3H). Anal. Calc'd for  $\text{C}_{22}\text{H}_{17}\text{ClF}_3\text{NO}_3\text{S}$ : C, 56.47, H, 3.66, N 2.99; found: C, 56.48, H, 3.28, N 3.04.

25

-117-

## Example 38

5     Synthesis of [5-hydroxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 38)



38

A solution of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid, prepared according to Example 4, (1.0 g, 2.2 mmol) in 75 mL DCM at 0 °C, was treated with dropwise addition of BBr<sub>3</sub> (5.5 mL of a 1.0 M solution in DCM). After 30 minutes, the reaction was carefully quenched with 50% NH<sub>4</sub>OH. The reaction was then acidified to pH 1 with conc. HCl, and extracted with EtOAc. The organic layer was dried (Na<sub>2</sub>SO<sub>4</sub>) and concentrated in vacuo. The crude reaction mixture was then taken up in MeOH, followed by addition of 50 µL H<sub>2</sub>SO<sub>4</sub>, and then refluxing for 3 hours. The reaction was then diluted with EtOAc, washed 1 x 50 mL water, dried (Na<sub>2</sub>SO<sub>4</sub>), and the reaction concentrated in vacuo. The resulting ester was purified by recrystallization from EtOAc/Hexanes. The ester was then saponified in the same manner as described for Example 1, to give the title compound in 37% overall yield. IR cm<sup>-1</sup>: 3408, 1752, 1323; 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 9.56 (s, 1H), 7.82 (d, 2H, *J* = 8.4 Hz), 7.74 (d, 2H, *J* = 8.4 Hz), 7.31 (d, 2H, *J* = 8.4 Hz), 6.92 (s, 1H), 6.30 (s, 1H), 4.55 (s, 2H), 4.00 (s, 2H), 1.95 (s,

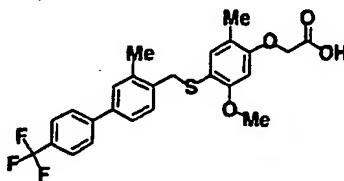
-118-

3H). Anal. Calc'd for  $C_{23}H_{19}F_3NO_4S \cdot 0.1 H_2O$  C, 61.35; H, 4.30; found: C, 61.08; H, 3.92.

### Example 39

5

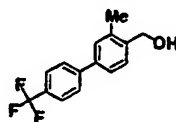
#### Synthesis of [5-Methoxy-2-methyl-4-(3-methyl-4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-phenoxy]-acetic acid (compound 39)



10

39

#### Step 1. Preparation of (3-Methyl-4'-trifluoromethyl-biphenyl-4-yl)-methanol (compound 39A)



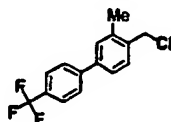
15

39A

The title compound was prepared in the manner analogous to **Example 3A** using (4-bromo-2-methyl-phenyl)-methanol and 4-(trifluoromethyl)benzeneboronic acid. MS  $m/z$  249 (M-OH).

20

#### Step 2. Preparation of 4-chloromethyl-3-methyl-4'-trifluoromethyl-biphenyl (compound 39B)

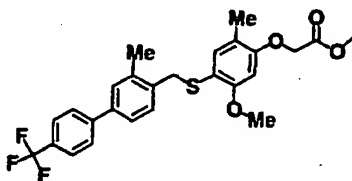


39B

-119-

The title compound was prepared in the manner analogous to **Example 3B** using **39A**. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.84 (d, 2H,  $J = 8.3$  Hz), 7.76 (d, 2H,  $J = 8.3$  Hz), 7.57 (s, 1H), 7.48 (m, 2H), 4.80 (s, 2H), 2.41 (s, 3H).

- 5      **Step 3. Preparation of [5-Methoxy-2-methyl-4-(3-methyl-4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-phenoxy]-acetic acid methyl ester (compound 39C)**



39C

- 10      The title compound was prepared in the manner analogous to **Example 1F** using **1D** and **39B**. MS  $m/z$  491 ( $M+1$ ).

**Step 4. Preparation of [5-Methoxy-2-methyl-4-(3-methyl-4'-trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-phenoxy]-acetic acid (compound 39)**

15

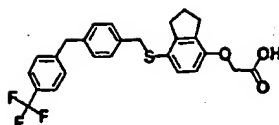
The title compound was prepared in the manner analogous to **Example 1** using **39C**. IR  $\text{cm}^{-1}$ : 1740, 1322; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.81 (d, 2H,  $J = 8.1$  Hz), 7.73 (d, 2H,  $J = 8.1$  Hz), 7.51 (s, 1H), 7.39 (d, 1H,  $J = 7.8$  Hz), 7.16 (d, 1H,  $J = 7.8$  Hz), 7.04 (s, 1H), 6.53 (s, 1H), 4.71 (s, 2H), 4.00 (s, 2H), 3.73 (s, 3H), 2.39 (s, 3H), 2.02 (s, 3H); MS  $m/z$  477 ( $M+1$ ). Anal. Calc'd for  $\text{C}_{25}\text{H}_{23}\text{F}_3\text{O}_4\text{S} \cdot 0.1 \text{H}_2\text{O}$ ; C, 62.78; H, 4.89; found: C, 62.57; H, 4.82.

20

### Example 40

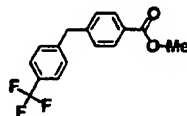
- 25      Synthesis of {7-[4-(4-trifluoromethyl-benzyl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 40)

-120-



40

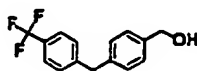
**Step 1. Preparation of 4-(4-(trifluoromethyl)-benzyl)-benzoic acid methyl ester (compound 40A)**



40A

A solution of 1-bromo-4-(trifluoromethyl)-benzene (10.0 g, 44.4 mmol) in THF at  $-78^{\circ}\text{C}$  was treated with dropwise addition of *n*-butyl lithium (33.3 mL of a 1.6 M solution in hexanes). After 20 minutes, 4-formyl-benzoic acid methyl ester in 50 mL THF was added. The reaction was allowed to come to room temperature and after 1 h, quenched with sat.  $\text{NH}_4\text{Cl}$ . The reaction was then concentrated in vacuo, taken up in EtOAc, and washed with 2 M HCl (1 x 100 mL), brine (1 x 100 mL), dried ( $\text{Na}_2\text{SO}_4$ ) and the solvent removed in vacuo to give the alcohol intermediate. Purification by flash column chromatography (gradient elution: 5% EtOAc/hexane to 40% EtOAc/hexane) gave 6.2 g of the alcohol intermediate. 4.0 g (12.9 mmol) of the intermediate was then hydrogenated in EtOAc using 0.5 g of 10 %  $\text{Pd}(\text{OH})_2/\text{C}$  as catalyst. Filtration through Celite®, and concentration in vacuo gave the title compound (3.60 g, 95%). MS  $m/z$  295 ( $\text{M}+1$ ).

**Step 2. Preparation of [4-(4-(trifluoromethyl)-benzyl)-phenyl]-methanol (compound 40B)**

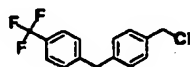


40B

-121-

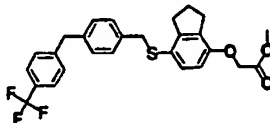
A solution of 40A (3.6 g, 12.2 mmol) in 75 mL THF at room temperature was treated portionwise with lithium aluminum hydride (0.97 g, 25.6 mmol). After 1 hour, the reaction mixture was carefully quenched with sat.  $\text{NH}_4\text{Cl}$ . The reaction mixture was then extracted with EtOAc, and the organic layer washed with 2 M HCl (1 x 50 mL), brine (1 x 50 mL), dried ( $\text{Na}_2\text{SO}_4$ ) and the solvent removed in vacuo. Purification by flash column chromatography (gradient elution: 5% EtOAc/hexane to 40% EtOAc/hexane) gave the title compound (2.8 g, 86%). MS  $m/z$  265 (M-1).

**Step 3. Preparation of Chloro-[4-(4-trifluoromethyl-benzyl)-phenyl]-methane (compound 40C)**

**40C**

The title compound was prepared in a similar manner as described for 3B using 40B and thionyl chloride. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ ) 7.59 (d, 2H,  $J = 8.4$  Hz), 7.40 (d, 2H,  $J = 8.4$  Hz), 7.31 (d, 2H,  $J = 8.4$  Hz), 7.20 (d, 2H,  $J = 8.4$  Hz), 4.67 (s, 2H), 3.99 (s, 2H).

**Step 4. Preparation of {7-[4-(4-Trifluoromethyl-benzyl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 40D)**

**40D**

-122-

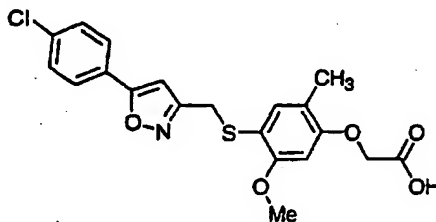
The title compound was prepared in the manner analogous to Example 1F using the products from Example 12C and Example 40C. MS  $m/z$  487 (M+1).

**Step 5. Preparation of {7-[4-(4-trifluoromethyl-benzyl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 40)**

The title compound was prepared in the manner analogous to Example 1 using 40D. IR  $\text{cm}^{-1}$ : 1745, 1704, 1325; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.58 (d, 2H,  $J = 8.1$  Hz), 7.37 (d, 2H,  $J = 8.1$  Hz), 7.09 (s, 2H), 7.05 (d, 2H,  $J = 8.3$  Hz), 6.55 (d, 1H,  $J = 8.3$  Hz), 4.60 (s, 2H), 3.94 (s, 4H), 2.71 (t, 2H,  $J = 8.3$  Hz), 2.58 (t, 2H,  $J = 8.3$  Hz), 1.81 (m, 2H); MS  $m/z$  473 (M+1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{23}\text{F}_3\text{O}_3\text{S} \cdot 0.1 \text{ H}_2\text{O}$ , C, 65.84; H, 4.93; found: C, 65.58; H, 4.96.

**Example 41**

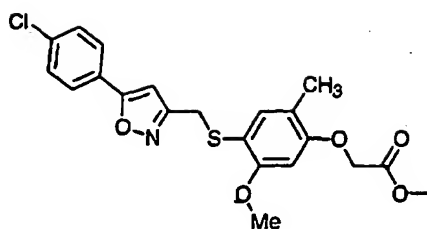
**Synthesis of {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-5-methoxy-2-methyl-phenoxy}-acetic acid (compound 41)**



41

**Step 1. Preparation of {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-5-methoxy-2-methyl-phenoxy}-acetic acid methyl ester (compound 41A)**

-123-



41A

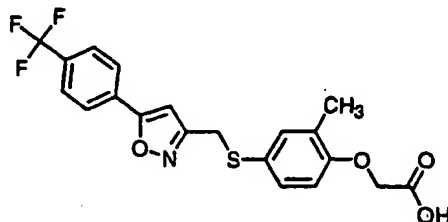
The title compound was prepared in the manner analogous to **Example 1F** using **1D** and 3-chloromethyl-5-(4-chloro-phenyl)-isoxazole. MS  $m/z$  434 (M+1).

**Step 2. Preparation of {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfonyl]-5-methoxy-2-methyl-phenoxy}-acetic acid (compound 41)**

The title compound was prepared in the manner analogous to **Example 1** using **41A**. IR  $\text{cm}^{-1}$ : 1747, 1432; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.81 (d, 2H,  $J = 8.8$  Hz), 7.53 (d, 2H,  $J = 8.8$  Hz), 7.05 (s, 1H), 6.92 (s, 1H), 6.52 (s, 1H), 4.69 (s, 2H), 4.01 (s, 2H), 3.71 (s, 3H), 2.00 (s, 3H); MS  $m/z$  420 (M+1). Anal. Calc'd for  $\text{C}_{20}\text{H}_{18}\text{ClNO}_5\text{S}$ , C 57.21; H, 4.32 N, 3.34; found: C, 56.84; H, 4.62, N, 2.96.

**Example 42**

**Synthesis of {2-Methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfonyl]-phenoxy}-acetic acid (compound 42)**

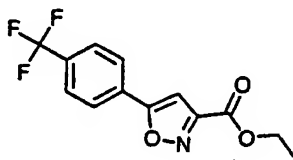


42



-124-

**Step 1. Preparation of 5-(4-Trifluoromethyl-phenyl)-isoxazole-3-carboxylic acid ethyl ester (compound 42A)**



42A

5

Sodium hydride (1.6 g, 63.7 mmol, 95%) was added to a solution of 1-(4-trifluoromethyl-phenyl)-ethanone (10.0 g, 53.1 mmol) and oxalic acid diethyl ester (8.7 mL, 63.7 mmol) in 75 mL dry DMF at 0 °C. The reaction was allowed to come to room temperature and then heated to 45 °C for 45 minutes. The reaction was then cooled, concentrated in vacuo, and the residue taken up in EtOAc. The organic layer was then washed with 2 M HCl (1 x 100 mL), dried (Na<sub>2</sub>SO<sub>4</sub>) and the solvent removed in vacuo. Purification by flash column chromatography (gradient elution: 5% EtOAc/hexane to 55% EtOAc/hexane) gave the intermediate 2,4-dioxo-4-(4-trifluoromethyl-phenyl)-butyric acid ethyl ester (12.2 g, 80%) which was then taken up in EtOH and refluxed in the presence of hydroxyl amine hydrochloride (10.2 g, 132.3 mmol) for 3H. The reaction was then cooled, diluted with EtOAc, washed with dilute NaHCO<sub>3</sub>, brine, dried (Na<sub>2</sub>SO<sub>4</sub>), and concentrated in vacuo. Recrystallization from EtOAc/hexane gave 5.2 g of the title compound. MS *m/z* 286 (M+1).

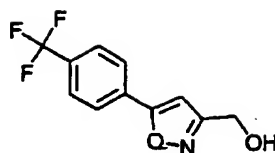
10

15

20

**Step 2. Preparation of [5-(4-Trifluoromethyl-phenyl)-isoxazol-3-yl]-methanol (compound 42B)**

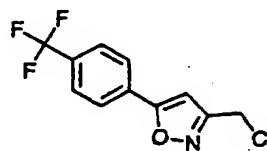
-125-

**42B**

5       The title compound was prepared in a manner analogous to **Example 40B** using **42A**.  
MS *m/z* 244 (M+1).

**Step 3. Preparation of 3-chloromethyl-5-(4-trifluoromethyl-phenyl)-isoxazole**  
**(compound 42C)**

10

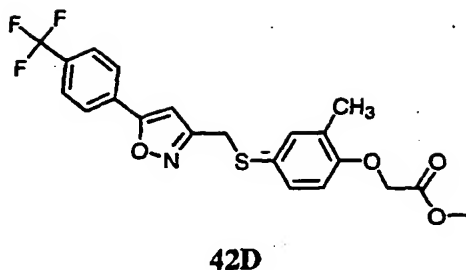
**42C**

15       The title compound was prepared in a manner analogous to **Example 3B** using **42B**.  
MS *m/z* 262 (M+1).

**Step 4. Preparation of {2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 42)**

20

-126-



5        The title compound was prepared in a manner analogous to **Example 1F** using **42C** and **2C**. MS  $m/z$  438 (M+1).

Step 5. Preparation of {2-Methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 42)

10

The title compound was prepared in a manner analogous to **Example 1** using **42D**. IR  $\text{cm}^{-1}$ : 1746, 1326; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.97 (br(s), 1H), 8.02 (d, 2H,  $J = 8.0$  Hz), 7.83 (d, 2H,  $J = 8.0$  Hz), 7.20 (s, 1H), 7.15 (s, 2H), 6.71 (d, 1H,  $J = 8.5$  Hz), 4.63 (s, 2H), 4.14 (s, 2H), 2.08 (s, 3H); MS  $m/z$  424 (M+1). Anal. Calc'd for  $\text{C}_{20}\text{H}_{16}\text{F}_3\text{NO}_4\text{S}$  C, 56.73; H, 3.81; N, 3.31 found: C, 56.59; H, 3.58; N, 3.22.

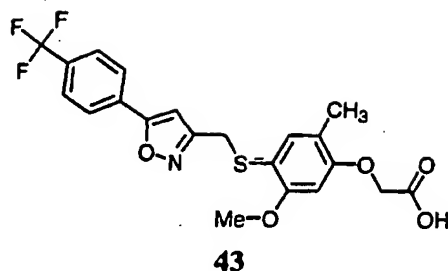
15

### Example 43

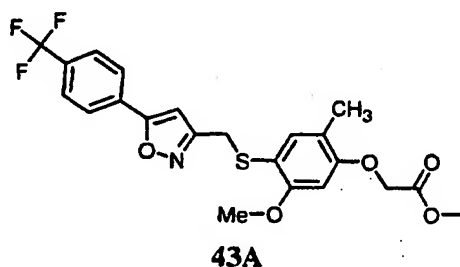
Synthesis of {5-Methoxy-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 43)

20

-127-



- 5      **Step 1. Preparation of {5-Methoxy-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 43A)**



10      The title compound was prepared in a manner analogous to Example 1F using 42C and 1D. MS  $m/z$  468 ( $M+1$ ).

- 15      **Step 2. Preparation of {5-Methoxy-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 43)**

The title compound was prepared in a manner analogous to Example 1 using 43A.

- 20      IR  $\text{cm}^{-1}$ : 1745, 1322; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.96 (br(s), 1H), 8.01 (d, 2H,  $J = 8.3$  Hz), 7.83 (d, 2H,  $J = 8.3$  Hz), 7.07 (s, 2H), 6.52 (s, 1H), 4.70 (s, 2H), 4.03 (s,

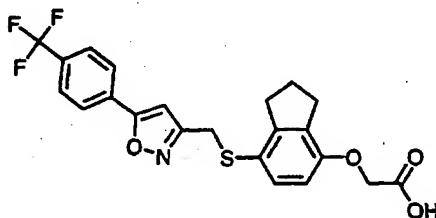
-128-

2H), 3.71 (s, 3H), 1.99 (s, 3H); MS  $m/z$  454 (M+1). Anal. Calc'd for  $C_{21}H_{18}F_3NO_5S \cdot 0.1H_2O$  C, 54.46; H, 3.92; N, 3.01 found: C, 54.54; H, 3.74; N, 2.93.

**Example 44**

5

**Synthesis of {7-[5-(4-Trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 44)**

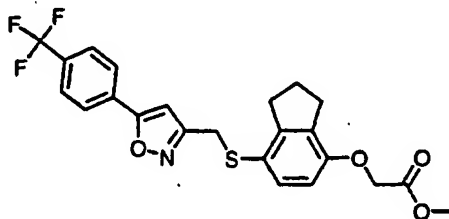


10

44

**Step 1. Preparation of {7-[5-(4-Trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 44A)**

15



44A

20

The title compound was prepared in a manner analogous to **Example 1F** using **42C** and **12C**. MS  $m/z$  464 (M+1).

-129-

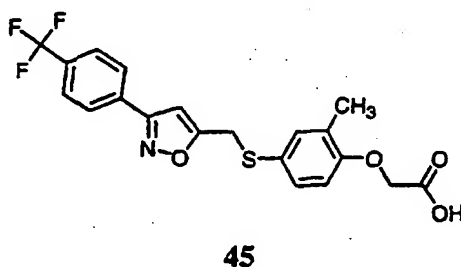
**Step 2. Preparation of {7-[5-(4-Trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 44)**

The title compound was prepared in a manner analogous to Example 1 using 44A.

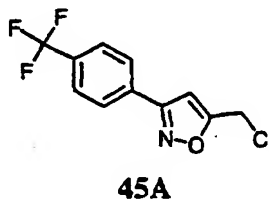
400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.94 (br(s), 1H), 8.01 (d, 2H,  $J = 8.4$  Hz), 7.83 (d, 2H,  $J = 8.4$  Hz), 7.09 (s, 2H), 6.58 (d, 1H,  $J = 8.6$  Hz), 4.62 (s, 2H), 4.08 (s, 2H), 2.77 (m, 4H), 1.89 (m, 2H); MS  $m/z$  450 ( $M+1$ ). Anal. Calc'd for  $\text{C}_{22}\text{H}_{18}\text{F}_3\text{NO}_4\text{S}$  C, 58.79; H, 4.04; N, 3.12 found: C, 58.59; H, 3.80; N, 3.01.

**Example 45**

**Synthesis of {2-Methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 45)**



**Step 1. Preparation of 5-chloromethyl-3-(4-trifluoromethyl-phenyl)-isoxazole (compound 45A)**

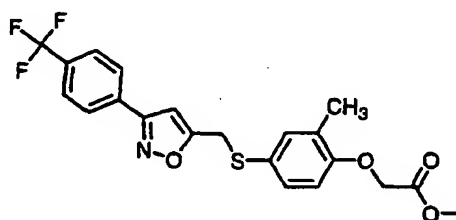


A solution of 4-trifluoromethyl-benzaldehyde oxime (8.9 g, 47.1 mmol) in 100 mL DCM was added to a rapidly stirred solution of propargyl chloride (47.1 mmol),

-130-

triethyl amine (4.71 mmol) and 91 mL of commercial bleach (6.5% by weight) all in 50 mL DCM at 0 °C. After 1 hour the layers were separated and the organic layer dried ( $\text{Na}_2\text{SO}_4$ ), and concentrated in vacuo. Purification by flash column chromatography (gradient elution: 5% EtOAc/hexane to 25% EtOAc/hexane) gave the title compound (2.9 g, 23%) MS  $m/z$  262 ( $M+1$ ).

**Step 2. Preparation of {2-Methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 45B)**

**45B**

The title compound was prepared in a manner analogous to **Example 1F** using **45A** and **2C**. MS  $m/z$  438 ( $M+1$ ).

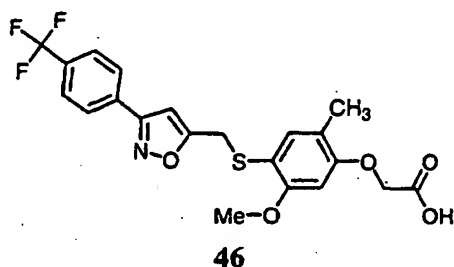
**Step 3. Preparation of {2-Methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 45)**

The title compound was prepared in a manner analogous to **Example 1** using **45B**. IR  $\text{cm}^{-1}$ : 1747; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.97 (br(s), 1H), 7.99 (d, 2H,  $J = 8.0$  Hz), 7.81 (d, 2H,  $J = 8.0$  Hz), 7.21 (s, 1H), 7.16 (d, 1H,  $J = 8.5$  Hz), 6.86 (s, 1H), 6.74 (d, 1H,  $J = 8.5$  Hz), 4.63 (s, 2H), 4.30 (s, 2H), 2.09 (s, 3H); MS  $m/z$  424 ( $M+1$ ).

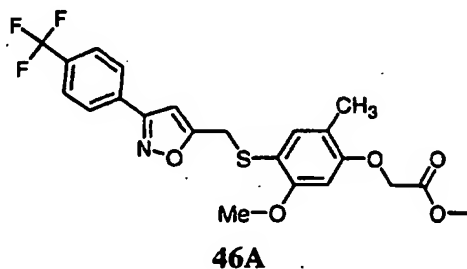
-131-

## Example 46

5     Synthesis of {5-Methoxy-2-methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 46)



10     **Step 1. Preparation of {5-Methoxy-2-methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 46A)**



15     The title compound was prepared in a manner analogous to Example 1F using 45A and 1D. MS  $m/z$  468 ( $M+1$ ).

20     **Step 2. Preparation of {5-Methoxy-2-methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 46)**



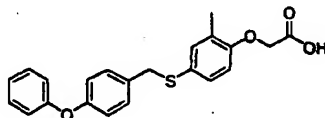
-132-

The title compound was prepared in a manner analogous to **Example 1** using **46A**.

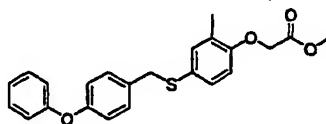
IR  $\text{cm}^{-1}$ : 1752, 1711; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.96 (br(s), 1H), 7.98 (d, 2H,  $J = 8.1$  Hz), 7.81 (d, 2H,  $J = 8.1$  Hz), 7.09 (s, 1H), 6.80 (s, 1H), 6.54 (s, 1H), 4.71 (s, 2H), 4.18 (s, 2H), 3.79 (s, 3H), 2.00 (s, 3H); MS  $m/z$  454 ( $M+1$ )

### Example 47

#### Synthesis of [2-Methyl-4-(4-phenoxy-benzylsulfanyl)-phenoxy]-acetic acid (compound 47)

**47**

**Step 1. Preparation of [2-Methyl-4-(4-phenoxy-benzylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 47A)**

**47A**

The title compound was prepared in the manner analogous to **Example 1F** with 1-chloromethyl-4-phenoxy-benzene and **2C**. MS  $m/z$  321 ( $M$ -methylacetate).

**Step 2. Preparation of [2-Methyl-4-(4-phenoxy-benzylsulfanyl)-phenoxy]-acetic acid (compound 47)**

The title compound was prepared in the manner analogous to **Example 1** using **47A**.

400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.95 (br(s), 1H), 7.33 (m, 2H), 7.22 (m, 2H), 7.07

-133-

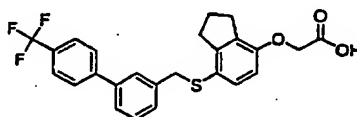
(m, 3H), 6.93 (m, 2H), 6.87 (m, 2H), 6.71 (d, 1H,  $J=8.3$  Hz), 4.62 (s, 2H), 4.04 (s, 2H), 2.09 (s, 3H). MS  $m/z$  379 (M-1).

5

**Example 48**

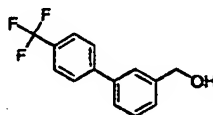
Synthesis of [7-(4'-Trifluoromethyl-biphenyl-3-yl)methylsulfanyl]-indan-4-yloxy]-acetic acid (compound 48)

10

**48**

15

**Step 1. Preparation of (4'-Trifluoromethyl-biphenyl-3-yl)-methanol (compound 48A)**

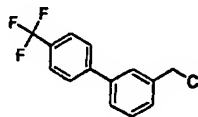
**48A**

20

The title compound was prepared in the manner analogous to **Example 3A** with 1-bromo-4-trifluoromethyl-benzene and 3-(hydroxymethyl)phenyl boronic acid. MS  $m/z$  251 (M-1).

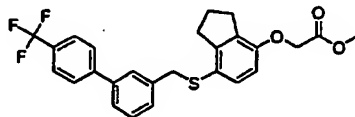
-134-

**Step 2. Preparation of 3-Chloromethyl-4'-trifluoromethyl-biphenyl (compound 48B)**

**48B**

The title compound was prepared in the manner analogous to Example 3B using 48A. MS  $m/z$  236 ( $M+1-\text{Cl}$ ).

**Step 3. Preparation of [7-(4'-Trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid methyl ester (compound 48C)**

**48C**

The title compound was prepared in the manner analogous to Example 1F using 12C and 48B. MS  $m/z$  473 ( $M+1$ ).

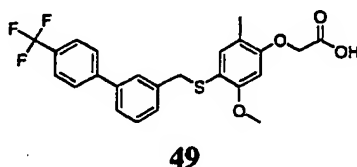
**Step 4. Preparation of [7-(4'-Trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-indan-4-yloxy]-acetic acid (compound 48)**

The title compound was prepared in the manner analogous to Example 1 using 48C. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.96 (br(s), 1H), 7.75 (d, 2H,  $J = 8.3$  Hz), 7.67 (d, 2H,  $J = 8.1$  Hz), 7.52 (m, 1H), 7.37 (t, 1H,  $J = 7.6$  Hz), 7.29 (m, 2H), 7.13 (d, 1H,  $J = 8.5$  Hz), 6.61 (d, 1H,  $J = 8.5$  Hz), 4.63 (s, 2H), 4.05 (s, 2H), 2.71 (t, 2H), 2.58 (t, 2H), 1.81 (m, 2H). MS  $m/z$  459 ( $M+1$ ).

-135-

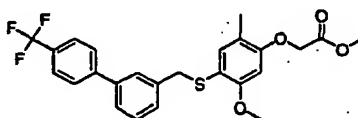
**Example 49**

5     **Synthesis of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 49)**



10

**Step 1. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 49A)**



15

The title compound was prepared in the manner analogous to **Example 1F** using **48B** and **1D**. MS  $m/z$  477 ( $M+1$ ).

20

**Step 2. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 49)**

The title compound was prepared in the manner analogous to **Example 1** using **49A**.  
400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.96 (br(s), 1H), 7.73 (d, 2H,  $J=9$  Hz), 7.71 (d, 2H,  $J=9$  Hz), 7.50 (m, 1H), 7.42 (m, 1H), 7.36 (t, 1H,  $J=7.8$  Hz), 7.28 (m, 1H), 6.99

25

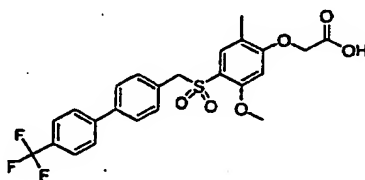
-136-

(s, 1H), 6.53 (s, 1H), 4.70 (s, 2H), 4.03 (s, 2H), 3.73 (s, 3H), 1.99 (s, 3H). MS  $m/z$  463 (M+1).

5

**Example 50**

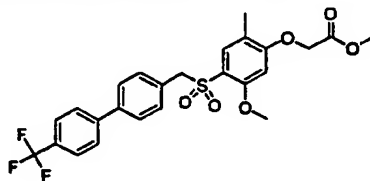
**Synthesis of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfonyl)-phenoxy]-acetic acid (compound 50)**



10

**50**

**Step 1. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfonyl)-phenoxy]-acetic acid methyl ester (compound 50A)**



15

**50A**

**Example 4** (200 mg) was dissolved in 5 ml dichloromethane. Excess *m*-chloroperbenzoic acid (300 mg) was added and the reaction was allowed to stir 3h. The solvent was removed under vacuum and the crude product was purified by MPLC. MS  $m/z$  509 (M+1).

20

**Step 2. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfonyl)-phenoxy]-acetic acid (compound 50)**

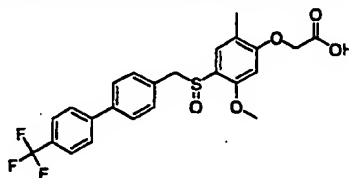
-137-

The title compound was prepared in the manner analogous to **Example 1** using **50A**.  
400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  13.13 (br(s), 1H), 7.85 (d, 2H,  $J=8.1$  Hz), 7.77 (d,  
2H,  $J=8.3$  Hz), 7.66 (d, 2H,  $J=8.6$  Hz), 7.3 (m, 3H), 6.76 (s, 1H), 4.89 (s, 2H), 4.67 (s,  
2H), 3.96 (s, 3H), 2.04 (s, 3H). MS  $m/z$  495 ( $M+1$ ).

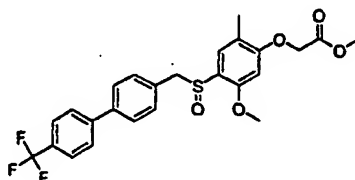
5

**Example 51**

10 **Synthesis of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfinyl)-phenoxy]-acetic acid (compound 51)**

**51**

15 **Step 1. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfinyl)-phenoxy]-acetic acid methyl ester (compound 51A)**

**51A**

20

**Example 4** (0.5g, 1.0 mmol) was dissolved in 25 ml dichloromethane followed by the addition of 2-benzenesulfonyl-3-phenyl-oxaziridine (0.274, 1.04 mmol). The reaction was stirred 1h. 10 ml water was added, the layers were separated, and dichloromethane solution was dried over anhydrous sodium sulfate, decanted, and

-138-

concentrated. The product was recrystallized from ethyl acetate to give the title product. MS  $m/z$  493 (M+1).

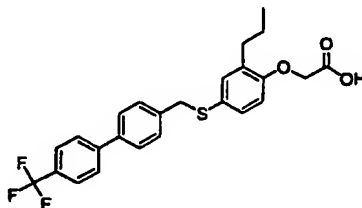
5 **Step 2. Preparation of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethanesulfinyl)-phenoxy]-acetic acid (compound 51)**

The title compound was prepared in the manner analogous to **Example 1** using **51A**.  
400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.83 (d, 2H,  $J=8.78$  Hz), 7.76 (d, 2H,  $J=8.30$  Hz),  
7.59 (d, 2H,  $J=8.30$  Hz), 7.11 (d, 2H,  $J=8.30$  Hz), 7.02 (s, 1H), 6.64 (s, 1H), 4.79 (s,  
10 2H), 4.20 (d, 1H,  $J=12.7$  Hz), 3.91 (d, 1H,  $J=12.4$  Hz), 3.76 (s, 3H), 2.03 (s, 3H). MS  
 $m/z$  479 (M+1).

**Example 52**

15

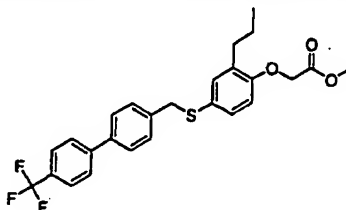
**Synthesis of [2-Propyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfonyl)-phenoxy]-acetic acid (compound 52)**

**52**

20

-139-

**Step 1. Preparation of [2-Propyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid methyl ester (compound 52A)**



52A

The title compound was prepared in the manner analogous to **Example 1F** using **48B** and (4-Mercapto-2-propyl-phenoxy)-acetic acid methyl ester, prepared from 2-propylphenol in a manner analogous to **Example 2**. MS  $m/z$  475 (M+1).

**Step 2. Preparation of [2-Propyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid (compound 52)**

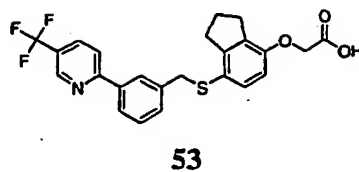
The title compound was prepared in the manner analogous to **Example 1** using **52A**. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.81 (d, 2H,  $J=8.5$  Hz), 7.74 (d, 2H,  $J=8.5$  Hz), 7.60 (d, 2H,  $J=8.1$  Hz), 7.33 (d, 2H,  $J=8.3$  Hz), 7.10 (m, 1H), 7.02 (m, 1H), 6.71 (d, 1H,  $J=8.5$  Hz), 4.60 (s, 2H), 4.11 (s, 2H), 1.43 (m, 2H), 0.77 (m, 3H). MS  $m/z$  459 (M-1).

**Example 53**

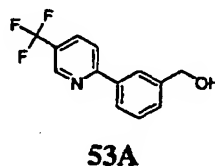
**Synthesis of (7-[3-(5-Trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy)-acetic acid (compound 53)**



-140-



Step 1. Preparation of [3-(5-Trifluoromethyl-pyridin-2-yl)-phenyl]-methanol  
(compound 53A)



The title compound was prepared in the manner analogous to Example 3A using 3-(hydroxymethyl)phenyl boronic acid and 2-chloro-5-trifluoromethyl-pyridine. MS  $m/z$  253 ( $M+1$ ).

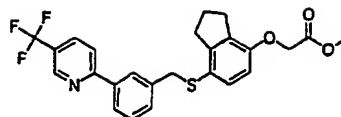
Step 2. Preparation of 2-(3-Chloromethyl-phenyl)-5-trifluoromethyl-pyridine  
(compound 53B)



The title compound was prepared in the manner analogous to Example 3B using 53A. MS  $m/z$  237 ( $M+1-Cl$ ).

Step 3. Preparation of {7-[3-(5-Trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 53C)

-141-



53C

5 The title compound was prepared in the manner analogous to **Example 1F** using **12C** and **53B**. MS  $m/z$  474 (M+1).

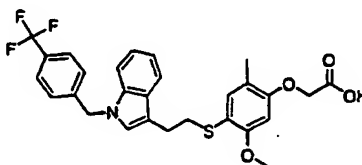
**Step 4. Preparation of {7-[3-(5-Trifluoromethyl)-pyridin-2-yl]-benzylsulfanyl}-indan-4-yloxy}-acetic acid (compound 53)**

10 The title compound was prepared in the manner analogous to **Example 1** using **53C**. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  8.98 (m, 1H), 8.23 (dd, 1H,  $J=1.7$  Hz,  $J'=8.5$  Hz), 7.99 (m, 2H), 7.87 (s, 1H), 7.39 (t, 1H,  $J=7.6$  Hz), 7.33 (m, 1H), 7.11 (d, 1H,  $J=8.5$  Hz), 6.58 (d, 1H,  $J=8.5$  Hz), 4.61 (s, 2H), 4.08 (s, 2H), 2.70 (t, 2H,  $J=7.3$  Hz), 2.63 (t, 2H,  $J=7.6$  Hz), 1.84 (m, 2H). MS  $m/z$  460 (M+1).

15

**Example 54**

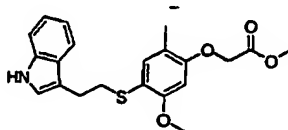
20 Synthesis of (5-Methoxy-2-methyl-4-[2-[1-(4-trifluoromethyl-benzyl)-1H-indol-3-yl]-ethylsulfanyl]-phenoxy)-acetic acid (compound 54)



54

-142-

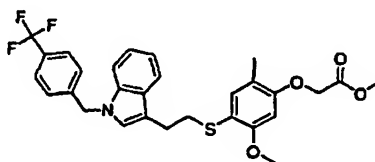
Step 1. Preparation of {4-[2-(1H-Indol-3-yl)-ethylsulfanyl]-5-methoxy-2-methyl-phenoxy}-acetic acid methyl ester (compound 54A)



54A

The compound 1D (1.622 g, 6.7 mmol) and 3-(2-bromo-ethyl)-1H-indole (1.50g, 6.69 mmol) was dissolved in 5 ml DMF. Potassium carbonate (1.11g, 8.03 mmol) was added followed by stirring at room temperature for 3h. The reaction was filtered, concentrated and purified by MPLC to give the title compound. MS  $m/z$  225 (M+1).

Step 2. Preparation of (5-Methoxy-2-methyl-4-{2-[1-(4-trifluoromethyl-benzyl)-1H-indol-3-yl]-ethylsulfanyl}-phenoxy)-acetic acid methyl ester (compound 54B)



54B

The compound 54A (0.300g, 0.778 mmol) was dissolved in 5 ml DMF. NaH was added and stirred for 1/2 h. 4-trifluoromethylbenzyl bromide (0.223 g, 0.934 mmol) was added and the reaction was stirred for 1.5h. 10 ml 2N HCl was added to pH<4. The DMF solution was partitioned between 30ml water and 30 ml ethyl acetate. The organic solution was washed 2x30ml water 1x30ml brine, dried over sodium sulfate, decanted, concentrated and purified by MPLC to give the title product. MS  $m/z$  544 (M+1).

-143-

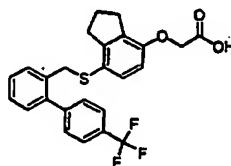
**Step 3. Preparation of (5-Methoxy-2-methyl-4-{2-[1-(4-trifluoromethyl-benzyl)-1H-indol-3-yl]-ethylsulfanyl}-phenoxy)-acetic acid (compound 54)**

The title compound was prepared in the manner analogous to **Example 1** using **54B**.

400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  13.0 (br(s), 1H), 7.60 (d, 1H,  $J=8.1$  Hz), 7.42 (d, 1H,  $J=7.96$  Hz), 7.31 (m, 4H), 7.04 (m, 2H), 6.96 (m, 1H), 6.53 (s, 1H), 5.43 (s, 2H), 4.70 (s, 2H), 3.72 (s, 3H), 3.03 (t, 2H,  $J=8.8$  Hz), 2.86 (t, 2H,  $J=7.6$  Hz), 2.04 (s, 3H). MS  $m/z$  530 ( $M+1$ ).

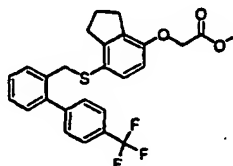
**Example 55**

**Synthesis of [7-(4'-Trifluoromethyl-biphenyl-2-yl)methylsulfanyl]-indan-4-yloxy]-acetic acid (compound 55)**



**55**

**Step 1. Preparation of [7-(4'-Trifluoromethyl-biphenyl-2-yl)methylsulfanyl]-indan-4-yloxy]-acetic acid methyl ester (compound 55A)**



**55A**

-144-

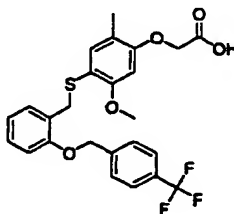
The title compound was prepared in the manner analogous to **Example 1F** using **12C**, and 2-chloromethyl-4'-trifluoromethyl-biphenyl, which was prepared in a manner analogous to **Examples 3A** and **3B**. MS *m/z* 473 (M+1).

**5 Step 2. Preparation of [7-(4'-Trifluoromethyl-biphenyl-2'-yl)methylsulfanyl]-indan-4-yloxy]-acetic acid (compound 55)**

The title compound was prepared in the manner analogous to **Example 1** using **55A**. 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 12.97 (br(s), 1H), 7.68 (d, 2H, *J*=8.5 Hz), 7.32 (m, 5H), 7.11 (m, 1H), 6.77 (d, 1H, *J*=8.5 Hz), 6.47 (d, 1H, *J*=8.3 Hz), 4.62 (s, 2H), 3.87 (s, 2H), 2.70 (m, 2H), 1.76 (m, 2H). MS *m/z* 459 (M+1).

### Example 56

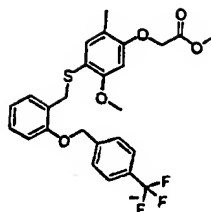
**Synthesis of {5-Methoxy-2-methyl-4-[2-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 56)**



56

**Step 1. Preparation of {5-Methoxy-2-methyl-4-[2-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 56A)**

-145-



56A

- 5 The title compound was prepared in the manner analogous to Example 1F using 81A and 1D. MS  $m/z$  507 (M+1).

**Step 2. Preparation of 5-Methoxy-2-methyl-4-[2-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy]-acetic acid (compound 56)**

10

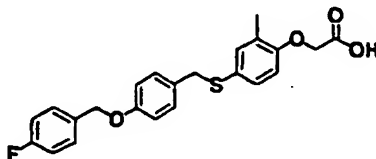
The title compound was prepared in the manner analogous to Example 1 using 56A. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  12.95 (br(s), 1H), 7.67 (m, 4H), 7.12 (m, 2H), 6.96 (m, 2H), 6.80 (m, 1H), 6.49 (s, 1H), 5.19 (s, 2H), 4.68 (s, 2H), 3.99 (s, 2H), 3.67 (s, 3H), 1.96 (s, 3H). MS  $m/z$  493 (M+1).

15

### Example 57

**Synthesis of {4-[4-(4-Fluoro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 57)**

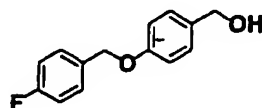
20



57

-146-

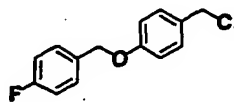
**Step 1. Preparation of [4-(4-Fluoro-benzyloxy)-phenyl]-methanol (compound 57A)**



57A

The title compound was prepared in the manner analogous to **Example 14A** using 1-bromomethyl-4-fluoro-benzene and 4-hydroxymethyl-phenol. MS  $m/z$  215 (M-OH).

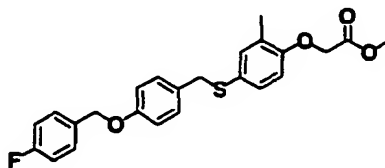
**Step 2. Preparation of 1-(4-Chloromethyl-phenoxy)methyl-4-difluoro-benzene (compound 57B)**



57B

The title compound was prepared in the manner analogous to **Example 3B** using 57A. MS  $m/z$  215 (M-Cl).

**Step 3. Preparation of {4-[4-(4-Fluoro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid methyl ester (compound 57C)**



57C

-147-

The title compound was prepared in the manner analogous to **Example 1F** using **57B** and **2C**. MS  $m/z$  427 (M+1).

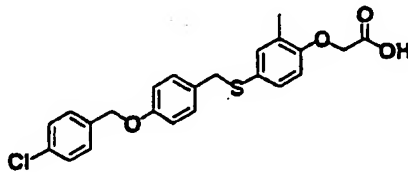
5      **Step 4. Preparation of {4-[4-(4-Fluoro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 57)**

The title compound was prepared in the manner analogous to **Example 1** using the product from **Example 57C**. mp 154-155 °C; IR (KBr)  $\text{cm}^{-1}$ : 3050, 2925, 1727, 1495, 1228, 1156; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  13.00 (br(s), 1H), 7.37-7.48 (m, 2H) 6.99-7.22 (m, 6H), 6.80-6.90 (m, 2H), 6.69 (d, 1H,  $J = 8.5$  Hz), 4.98 (s, 2H), 4.61 (s, 2H), 4.00 (s, 2H), 2.08 (s, 3H); MS  $m/z$  411 (M-1). Anal. Calc'd for  $\text{C}_{23}\text{H}_{21}\text{FO}_4\text{S}$ : C, 66.97; H, 5.13; found: C, 66.64; H, 4.88.

15

**Example 58**

**Synthesis of {4-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 58)**



20

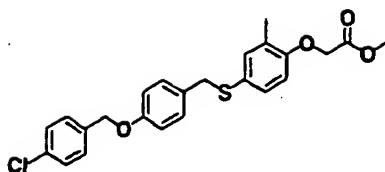
58

**Step 1. Preparation of {4-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid methyl ester (compound 58A)**

25



-148-



58A

The title compound was prepared in the manner analogous to **Example 1F** using 1-bromomethyl-4-chloro-benzene and the product from **Example 35C**. MS  $m/z$  443 (M+1).

**Step. 2. Preparation of {4-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 58)**

10

The title compound was prepared in the manner analogous to **Example 1** using **58A**. mp 164 °C; IR (KBr)  $\text{cm}^{-1}$ : 3062, 1727, 1612, 1493, 1226, 1193; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.99 (br(s), 1H), 7.36-7.44 (m, 4H), 7.01-7.17 (m, 4H), 6.81-6.89 (m, 2H), 6.69 (d, 1H,  $J = 8.5$  Hz), 5.01 (s, 2H), 4.61 (s, 2H), 4.00 (s, 2H), 2.08 (s, 3H); MS  $m/z$  427 (M-1). Anal. Calc'd for  $\text{C}_{23}\text{H}_{21}\text{ClO}_4\text{S}$ : C, 64.40; H, 4.93; found: C, 64.43; H, 4.81.

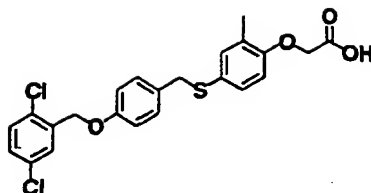
15

**Example 59**

20

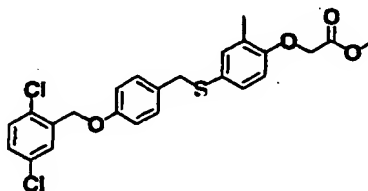
**Synthesis of 4-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 59)**

-149-



59

Step 1. Preparation of {4-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-  
phenoxy}-acetic acid methyl ester (compound 59A)



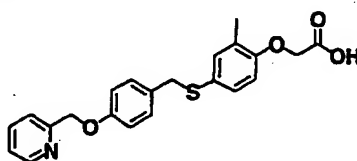
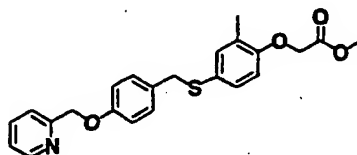
59A

The title compound was prepared in the manner analogous to Example 1F using 2-bromomethyl-1,4-dichloro-benzene and the product prepared from Example 35C.  $m/z$  265 (M-211).

Step 2. Preparation of {4-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-2-methyl-  
phenoxy}-acetic acid (compound 59).

The title compound was prepared in the manner analogous to Example 1 using 59A. mp 101-103 °C; IR (KBr)  $\text{cm}^{-1}$ : 3077, 1715, 1608, 1496, 1437, 1234; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  7.37-7.63 (m, 3H), 6.99-7.20 (m, 4H), 6.85-6.94 (m, 2H), 6.63 (d, 1H,  $J = 8.5$  Hz), 5.05 (s, 2H), 4.45 (s, 2H), 3.99 (s, 2H), 2.07 (s, 3H); HPLC: area % = 97.61, r.t. = 5.56 min.,  $\lambda = 214$  nm, mobile phase = acetonitrile/water with 0.10% TFA; MS  $m/z$  461 (M-1). Anal. Calc'd for  $\text{C}_{23}\text{H}_{20}\text{Cl}_2\text{O}_4\text{S}$ : C, 59.62; H, 4.35; found: C, 58.04; H, 4.26.

-150-

**Example 60****Synthesis of {2-Methyl-4-[4-(pyridine-2-ylmethoxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 60)****60****Step 1. Preparation of {2-Methyl-4-[4-(pyridine-2-ylmethoxy)-benzylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 60A)****60A**

The title compound was prepared in the manner analogous to **Example 1F** using 2-bromomethyl-pyridine hydrochloride and the product prepared from **Example 35C**. MS  $m/z$  410 (M+1).

**Step 2. Preparation of {2-Methyl-4-[4-(pyridine-2-ylmethoxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 60)**

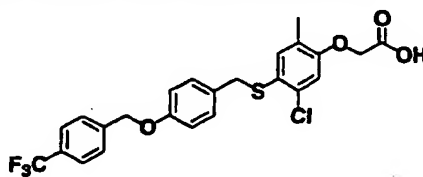
The title compound was prepared in the manner analogous to **Example 1** using **60A**. mp 150 °C; IR (KBr)  $\text{cm}^{-1}$ : 2917, 1723, 1605, 1511, 1490, 1217; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.95 (brs, 1H), 8.49-8.55 (s, 1H), 7.73-7.81 (m, 1H), 7.40-7.48 (m,

-151-

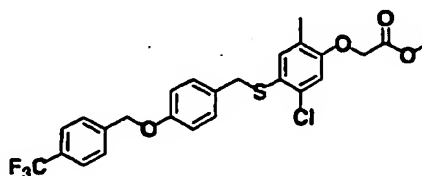
1H), 7.24-7.33 (m, 1H), 7.00-7.19 (m, 4H), 6.83-6.93 (m, 2H), 6.69 (d, 1H, J = 8.5 Hz), 5.08 (s, 2H), 4.62 (s, 2H), 4.00 (s, 2H), 2.08 (s, 3H); HPLC: area % = 96.24, r.t. = 1.95 min.,  $\gamma$  = 214 nm, mobile phase = acetonitrile/water with 0.10% TFA; MS  $m/z$  396 (M+1). Anal. Calc'd for  $C_{22}H_{21}NO_4S$ : C, 66.82; H, 5.35; N, 3.54; found: C, 66.12; H, 5.09; N, 3.44.

### Example 61

10 Synthesis of {5-Chloro-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid (compound 61)

**61**

15 **Step 1. Preparation of {5-Chloro-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzyl-sulfanyl]-phenoxy}-acetic acid methyl ester (compound 61A)**

**61A**

20

The title compound was prepared in the manner analogous to Example 1F using 14B and 20C. MS  $m/z$  265 (M-245).

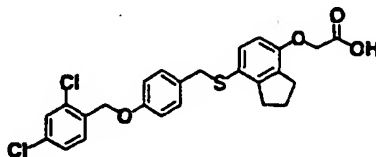
-152-

**Step 2. Preparation of {5-Chloro-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzyl-sulfanyl]-phenoxy}-acetic acid (compound 61)**

The title compound was prepared in the manner analogous to **Example 1** using **61A**.  
mp 142-143 °C; IR (KBr)  $\text{cm}^{-1}$ : 3074, 1747, 1321, 1234, 1175, 1124; 400 MHz  $^1\text{H}$   
NMR ( $\text{DMSO}-d_6$ ):  $\delta$  13.01 (br(s), 1H), 7.67-7.73 (m, 2H), 7.57-7.64 (m, 2H), 7.16-  
7.25 (m, 4H), 6.87-6.95 (m, 4H), 5.15 (s, 2H), 4.69 (s, 2H), 4.07 (s, 2H), 2.07 (s, 3H);  
MS  $m/z$  495 (M-1). Anal. Calc'd for  $\text{C}_{24}\text{H}_{20}\text{ClF}_3\text{O}_4\text{S}$ : C, 58.01; H, 4.06; found: C,  
57.73; H, 4.06.

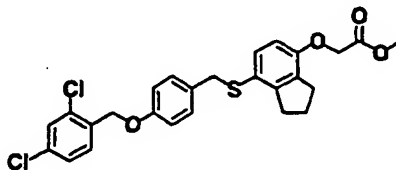
**Example 62**

**Synthesis of {7-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 62)**



**62**

**Step 1. Preparation of {7-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 62A)**



**62A**

-153-

The title compound was prepared in the manner analogous to **Example 1F** using **12C** and 4-chloromethyl-(2,4-dichloro-benzyloxy-benzene) prepared from 4-hydroxymethyl-phenol and 1-chloromethyl-2,4-dichloro-benzene in the manner analogous to **Examples 14A and 14B**. MS  $m/z$  503 ( $M+1$ ).

5

**Step 2. Preparation of {7-[4-(2,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 62)**

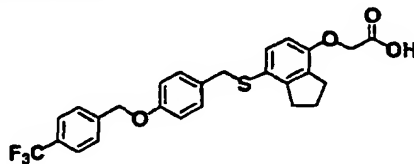
The title compound was prepared in the manner analogous to **Example 1** using **62A**. mp 149-150 °C; IR (KBr)  $\text{cm}^{-1}$ : 3089, 1734, 1512, 1473, 1295, 1234; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  13.11 (br(s), 1H), 7.40-7.71 (m, 3H), 6.88-7.19 (m, 5H), 6.58 (d, 1H,  $J = 8.5$  Hz), 5.07 (s, 2H), 4.61 (s, 2H), 3.96 (s, 2H), 2.77 (t, 2H,  $t$ ,  $J = 7.4$  Hz), 2.69 (t, 2H,  $J = 7.4$  Hz), 1.91 (pentet, 2H); MS  $m/z$  487 ( $M-1$ ). Anal. Calc'd for  $\text{C}_{25}\text{H}_{22}\text{Cl}_2\text{O}_4\text{S}$ : C, 61.35; H, 4.53; found: C, 60.95; H, 4.41.

15

**Example 63**

**Synthesis of {7-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 63)**

20

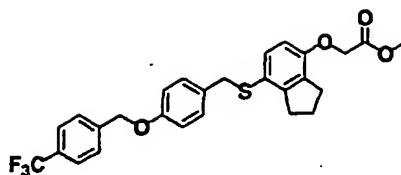


63

**Step 1. Preparation of {7-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 63A)**

25

-154-



63A

5 The title compound was prepared in the manner analogous to Example 1F using 14B and 12C. MS  $m/z$  265 (M-237).

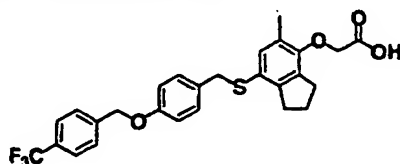
**Step 2. Preparation of {7-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 63)**

10 The title compound was prepared in the manner analogous to Example 1 using 63A. mp 145 °C; IR (KBr)  $\text{cm}^{-1}$ : 2968, 1740, 1510, 1325, 1248, 1110; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.99 (br(s), 1H), 7.66-7.75 (m, 2H), 7.55-7.65 (m, 2H); 7.01-7.15 (m, 3H) 6.83-6.90 (m, 2H), 6.56 (d, 1H,  $J = 8.5$  Hz), 5.14 (s, 2H), 4.60 (s, 2H), 3.93 (s, 2H), 2.74 (t, 2H,  $J = 7.6$  Hz), 2.65 (t, 2H,  $J = 7.4$  Hz), 1.87 (pentet, 2H); MS  $m/z$  15 487 (M-1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{23}\text{F}_3\text{O}_4\text{S}$ : C, 63.92; H, 4.75; found: C, 63.95; H, 4.65.

**Example 64**

20

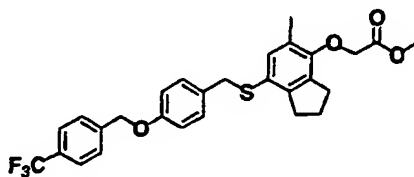
**Synthesis of {5-Methyl-7-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 64)**



64

-155-

**Step 1. Preparation of {5-Methyl-7-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 64A)**

**64A**

The title compound was prepared in the manner analogous to **Example 1F** using **14B** and (7-mercapto-5-methyl-indan-4-yloxy)-acetic acid methyl ester, which was prepared in a similar manner as described for **Example 12C**. MS  $m/z$  265 (M-251).

**Step 2. Preparation of {5-Methyl-7-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 64)**

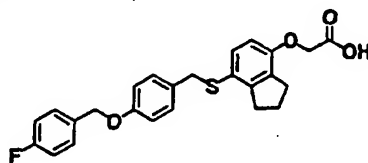
The title compound was prepared in the manner analogous to **Example 1** using **64A**. mp 165-167 °C; IR (KBr)  $\text{cm}^{-1}$ : 3039, 1707, 1510, 1329, 1163, 1112; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.81 (br(s), 1H), 7.66-7.74 (m, 2H), 7.56-7.64 (m, 2H); 7.11-7.19 (m, 2H), 6.94 (s, 1H), 6.85-6.91 (m, 2H), 5.15 (s, 2H), 4.40 (s, 2H), 3.99 (s, 2H), 2.81 (t, 2H,  $J = 7.4$  Hz), 2.59 (t, 2H,  $J = 7.4$  Hz), 2.13 (s, 3H), 1.86 (pentet, 2H); MS  $m/z$  501 (M-1). Anal. Calc'd for  $\text{C}_{27}\text{H}_{25}\text{F}_3\text{O}_4\text{S}$ : C, 64.53; H, 5.01; found: C, 64.33; H, 4.82.



-156-

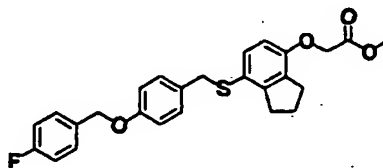
## Example 65

5     Synthesis of {7-[4-(4-Fluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 65)



65

10     **Step 1. Preparation of {7-[4-(4-Fluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 65A)**



65A

15     The title compound was prepared in the manner analogous to **Example 1F** using **12C** and 4-chloromethyl-(4-fluoro-benzyloxy-benzene), prepared from 4-hydroxymethyl-phenol and 1-bromomethyl-4-fluoro-benzene in a manner analogous to **Examples 14A and 14B**. MS  $m/z$  453 ( $M+1$ ).

20     **Step 2. Preparation of {7-[4-(4-Fluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 65)**

The title compound was prepared in the manner analogous to **Example 1** using **65A**. mp 153-155 °C; IR (KBr)  $cm^{-1}$ : 3117, 3028, 1731, 1512, 1471, 1231; 400 MHz  $^1H$

-157-

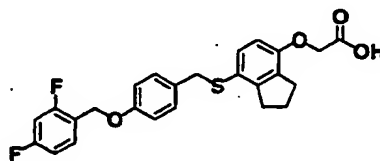
NMR (DMSO- $d_6$ ):  $\delta$  12.94 (br(s), 1H), 7.39-7.47 (m, 2H), 7.01-7.20 (m, 5H); 6.82-6.89 (m, 2H) 6.56 (d, 1H,  $J = 8.4$  Hz), 4.99 (s, 2H), 4.61 (s, 2H), 3.94 (s, 2H), 2.75 (t, 2H,  $J = 7.5$  Hz), 2.67 (t, 2H,  $J = 7.5$  Hz), 1.89 (pentet, 2H); MS  $m/z$  437 (M-1). Anal. Calc'd for  $C_{25}H_{23}FO_4S$ : C, 68.48; H, 5.29; found: C, 68.24; H, 5.15.

5

### Example 66

#### Synthesis of {7-[4-(2,4-Difluoro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 66)

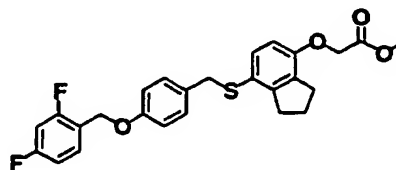
10



66

#### Step 1. Preparation of {7-[4-(2,4-Difluoro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 66A)

15



66A

20 The title compound was prepared in the manner analogous to Example 1F using 12C and 4-chloromethyl-(2,4-difluoro-benzyloxy-benzene) prepared from 4-hydroxymethyl-phenol and 1-bromomethyl-2,4-difluoro-benzene in the manner analogous to Examples 14A and 14B. MS  $m/z$  471 (M+1).

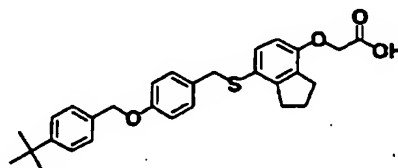
-158-

**Step 2. Preparation of {7-[4-(2,4-Difluoro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 66)**

The title compound was prepared in the manner analogous to **Example 1** using **66A**.  
mp 158-160 °C; IR (KBr)  $\text{cm}^{-1}$ : 3065, 3043, 1751, 1510, 1433, 1239; 400 MHz  $^1\text{H}$   
NMR ( $\text{DMSO-}d_6$ ):  $\delta$  12.94 (br(s), 1H), 7.51-7.61 (m, 1H), 7.21-7.30 (m, 1H); 7.01-  
7.16 (m, 4H) 6.83-6.92 (m, 2H), 6.57 (d, 1H,  $J = 8.5$  Hz), 5.01 (s, 2H), 4.61 (s, 2H),  
3.94 (s, 2H), 2.76 (t, 2H,  $J = 7.4$  Hz), 2.68 (t, 2H,  $J = 7.4$  Hz), 1.90 (pentet, 2H); MS  
 $m/z$  455 (M-1). Anal. Calc'd for  $\text{C}_{25}\text{H}_{22}\text{F}_2\text{O}_4\text{S}$ : C, 65.78; H, 4.86; found: C, 65.58; H,  
4.83.

**Example 67**

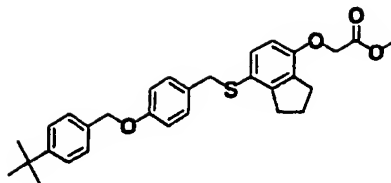
**Synthesis of {7-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 67)**



**67**

**Step 1. Preparation of {7-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 67A)**

-159-



67A

5 The title compound was prepared in the manner analogous to **Example 1F** using **12C** and 4-chloromethyl-(4-tert-butyl-benzyloxy-benzene) prepared from 4-hydroxymethyl-phenol and 1-bromomethyl-4-tert-butyl-benzene in the manner analogous to **Examples 14A and 14B**.  $m/z$  491 ( $M+1$ ).

10 **Step 2. Preparation of {7-[4-(4-tert-Butyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 67)**

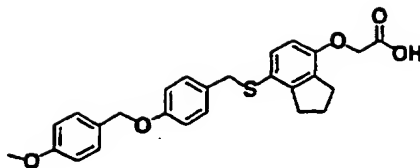
The title compound was prepared in the manner analogous to **Example 1** using **67A**. mp 152-153 °C; IR (KBr)  $\text{cm}^{-1}$ : 3134, 3032, 1745, 1708, 1473, 1228; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.94 (br(s), 1H), 7.25-7.39 (m, 4H), 7.01-7.14 (m, 3H) 6.80-6.89 (m, 2H), 6.57 (d, 1H,  $J = 8.5$  Hz), 4.97 (s, 2H), 4.61 (s, 2H), 3.93 (s, 2H), 2.75 (t, 2H,  $J = 7.5$  Hz), 2.67 (t, 2H,  $J = 7.5$  Hz), 1.89 (pentet, 2H), 1.22 (s, 9H); MS  $m/z$  475 ( $M-1$ ). Anal. Calc'd for  $\text{C}_{29}\text{H}_{32}\text{O}_4\text{S}$ : C, 73.08; H, 6.77; found: C, 72.97; H, 6.84.

20

### Example 68

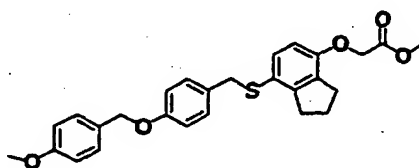
**Synthesis of {7-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 68)**

-160-



68

Step 1. Preparation of {7-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 68A)



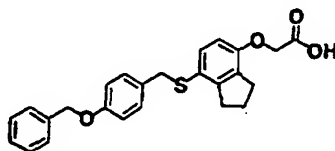
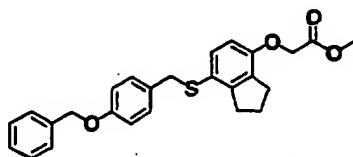
68A

The title compound was prepared in the manner analogous to Example 1F using 12C and 4-chloromethyl-(4-methoxy-benzyloxy-benzene) prepared from 4-hydroxymethyl-phenol and 1-bromomethyl-4-methoxy-benzene in the manner analogous to Examples 14A and 14B. MS  $m/z$  465 (M+1).

Step 2. Preparation of {7-[4-(4-Methoxy-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 68)

The title compound was prepared in the manner analogous to Example 1 using 68A. mp 183-185 °C; IR (KBr)  $\text{cm}^{-1}$ : 3015, 2588, 1742, 1716, 1514, 1243; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.97 (br(s), 1H), 7.26-7.34 (m, 2H), 7.06-7.13 (m, 2H) 7.04 (d, 1H,  $J = 8.5$  Hz), 6.80-6.92 (m, 4H), 6.56 (d, 1H,  $J = 8.5$  Hz), 4.92 (s, 2H), 4.60 (s, 2H), 3.93 (s, 2H), 3.69 (s, 3H), 2.75 (t, 2H,  $J = 7.3$  Hz), 2.67 (t, 2H,  $J = 7.3$  Hz), 1.89 (pentet, 2H); MS  $m/z$  449 (M-1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{26}\text{O}_5\text{S}$ : C, 69.31; H, 5.82; found: C, 69.00; H, 5.74.

-161-

**Example 69****Synthesis of [7-(4-Benzyloxy-benzylsulfanyl)-indan-4-yloxy]-acetic acid  
(compound 69)****69****Step 1. Preparation of [7-(4-Benzyloxy-benzylsulfanyl)-indan-4-yloxy]-acetic acid methyl ester (compound 69A)****69A**

The title compound was prepared in the manner analogous to **Example 1F** using **12C** and 1-benzyloxy-4-chloromethyl-benzene prepared from 4-hydroxymethyl-phenol and 4-bromomethyl-benzene in the manner analogous to Examples **14A** and **14B**. MS  $m/z$  435 ( $M+1$ ).

**Step 2. Preparation of [7-(4-Benzyloxy-benzylsulfanyl)-indan-4-yloxy]-acetic acid (compound 69)**

The title compound was prepared in the manner analogous to **Example 1** using **69A**. mp 145-147 °C; IR (KBr)  $\text{cm}^{-1}$ : 3066, 2584, 1742, 1511, 1234; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ ):  $\delta$  12.94 (br(s), 1H), 7.21-7.44 (m, 5H), 6.99-7.15 (m, 3H) 6.80-6.90 (m,

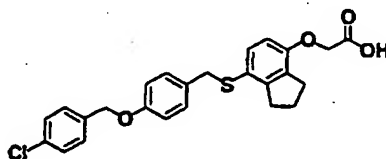
-162-

2H), 6.56 (d, 1H,  $J = 8.3$  Hz), 5.01 (s, 2H), 4.61 (s, 2H), 3.93 (s, 2H), 2.75 (t, 2H,  $J = 7.3$  Hz), 2.67 (t, 2H,  $J = 7.3$  Hz), 1.89 (pentet, 2H); MS  $m/z$  419 (M-1). Anal. Calc'd for  $C_{25}H_{24}O_4S$ : C, 71.40; H, 5.75; found: C, 71.46; H, 5.75.

5

### Example 70

#### Synthesis of {7-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 70)

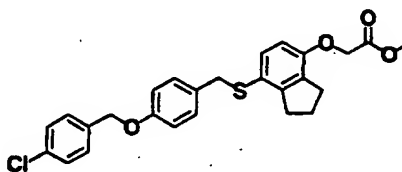


10

70

#### Step 1. Preparation of {7-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 70A)

15



70A

20

The title compound was prepared in the manner analogous to Example 1F using 12C and 1-(4-chloro-benzyloxy)-4-chloromethyl benzene prepared from 1-bromomethyl-4-chloro-benzene and 4-hydroxymethyl-phenol in the manner analogous to Examples 14A and 14B. MS  $m/z$  469 (M+1).

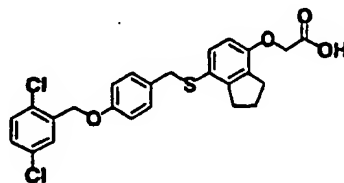
-163-

**Step 4. Preparation of {7-[4-(4-Chloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 70)**

The title compound was prepared in the manner analogous to **Example 1** using **70A**.  
mp 170-172 °C; IR (KBr)  $\text{cm}^{-1}$ : 3054, 25.77, 1731, 1710, 1471, 1234; 400 MHz  $^1\text{H}$   
NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.39 (s, 4H), 6.99-7.25 (m, 3H), 6.79-6.97  
(m, 2H), 6.56 (d, 1H,  $J = 8.4$  Hz), 5.01 (s, 2H), 4.60 (s, 2H), 3.93 (s, 2H), 2.74 (t, 2H,  
 $J = 7.4$  Hz), 2.66 (t, 2H,  $J = 7.4$  Hz), 1.88 (pentet, 2H); MS  $m/z$  453 (M-1). Anal.  
Calc'd for  $\text{C}_{25}\text{H}_{23}\text{ClO}_4\text{S}$ : C, 66.00; H, 5.10; found: C, 65.95; H, 4.97.

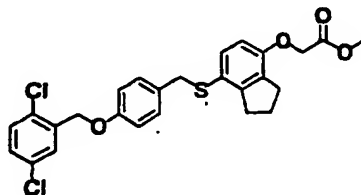
**Example 71**

**Synthesis of {7-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 71)**



**71**

**Step 1. Preparation of {7-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 71A)**



**71A**



-164-

The title compound was prepared in the manner analogous to Example 1F using 12C and 1,4-Dichloro-2-(4-chloromethyl-phenoxy)methyl)-benzene prepared from 1,4-dichloro-2-chloromethyl-benzene and 4-hydroxymethyl-phenol in the manner  
5 analogous to Examples 14A and 14B. MS  $m/z$  265 (M-237).

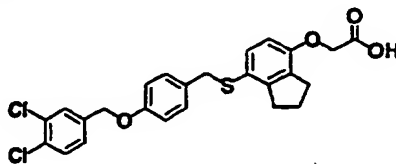
**Step 2. Preparation of {7-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 71)**

10 The title compound was prepared in the manner analogous to Example 1 using 71A. mp 158-160 °C; IR (KBr)  $\text{cm}^{-1}$ : 3070, 2573, 1747, 1716, 1236, 1106; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.57-7.62 (m, 1H) 7.47-7.53 (m, 1H), 7.38-7.45 (m, 1H), 7.08-7.16 (m, 2H), 7.04 (d, 1H,  $J = 8.5$  Hz), 6.85-6.92 (m, 2H), 6.56 (d, 1H,  $J = 8.5$  Hz), 5.06 (s, 2H), 4.61 (s, 2H), 3.94 (s, 2H), 2.75 (t, 2H,  $J = 7.3$  Hz), 2.67  
15 (t, 2H,  $J = 7.3$  Hz), 1.89 (pentet, 2H); MS  $m/z$  487 (M-1). Anal. Calc'd for  $\text{C}_{25}\text{H}_{22}\text{Cl}_2\text{O}_4\text{S}$ : C, 61.35; H, 4.53; found: C, 61.24; H, 4.43.

**Example 72**

20

**Synthesis of {7-[4-(3,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 72)**

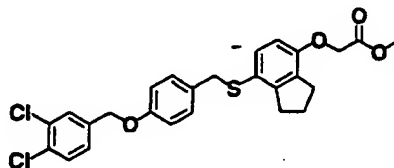


72

25

-165-

**Step 1. Preparation of {7-[4-(3,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 72A)**



72A

5

The title compound was prepared in the manner analogous to Example 1F using 12C and 1,2-Dichloro-4-(4-chloromethyl-phenoxy)methyl)-benzene prepared from 1-bromomethyl-3,4-dichloro-benzene and 4-hydroxymethyl-phenol in the manner  
10 analogous to Examples 14A and 14B. MS  $m/z$  503 (M+1).

**Step 2. Preparation of {7-[4-(3,4-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 72)**

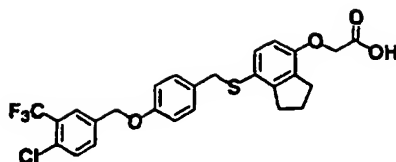
15 The title compound was prepared in the manner analogous to Example 1 using 72A. mp 168 °C; IR (KBr)  $\text{cm}^{-1}$ : 3084, 3039, 1744, 1708, 1244, 1226; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.57-7.67 (m, 2H) 7.37 (dd, 1H,  $J = 8.3, 2.0$  Hz), 7.01-7.14 (m, 3H), 6.82-6.89 (m, 2H), 6.56 (d, 1H,  $J = 8.4$  Hz), 5.04 (s, 2H), 4.61 (s, 2H), 3.93 (s, 2H), 2.75 (t, 2H,  $J = 7.4$  Hz), 2.66 (t, 2H,  $J = 7.4$  Hz), 1.88 (pentet, 2H);  
20 MS  $m/z$  487 (M-1). Anal. Calc'd for  $\text{C}_{25}\text{H}_{22}\text{Cl}_2\text{O}_4\text{S}$ : C, 61.35; H, 4.53; found: C, 61.13; H, 4.38.

**Example 73**

**Synthesis of {7-[4-(4-Chloro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 73)**

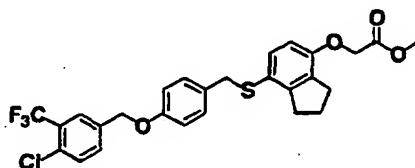
25

-166-



73-

Step 1. Preparation of {7-[4-(4-Chloro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 73A)



73A

The title compound was prepared in the manner analogous to Example 1F using 12C and 1-Chloro-4-(4-chloromethyl-phenoxy)methyl-2-trifluoromethyl-benzene prepared from 1-bromomethyl-4-chloro-3-trifluoromethyl-benzene and 4-hydroxymethyl-phenol in the manner analogous to Examples 14A and 14B. MS  $m/z$  299 (M-237).

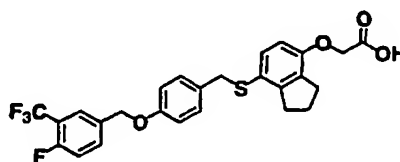
Step 2. Preparation of {7-[4-(4-Chloro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 73)

The title compound was prepared in the manner analogous to Example 1 using 73A. mp 151-152 °C; IR (KBr)  $\text{cm}^{-1}$ : 3076, 3050, 1748, 1426, 1244, 1109; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.94 (br(s), 1H), 7.87 (s, 1H), 7.68-7.72 (m, 2H) 7.00-7.15 (m, 3H), 6.82-6.92 (m, 2H), 6.56 (d, 1H,  $J = 8.5$  Hz), 5.12 (s, 2H), 4.61 (s, 2H), 3.94 (s, 2H), 2.74 (t, 2H,  $J = 7.5$  Hz), 2.66 (t, 2H,  $J = 7.5$  Hz), 1.87 (pentet, 2H); MS  $m/z$  521 (M-1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{22}\text{ClF}_3\text{O}_4\text{S}$ : C, 59.71; H, 4.24; found: C, 59.54; H, 4.11.

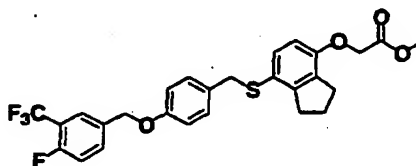
-167-

## Example 74

**Synthesis of {7-[4-(4-Fluoro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 74)**



**Step 1. Preparation of {7-[4-(4-Fluoro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 74A)**



74A

The title compound was prepared in the manner analogous to Example 1F using 12C and 4-(4-Chloromethyl-phenoxy)methyl)-1-fluoro-2-trifluoromethyl-benzene prepared from 1-bromomethyl-4-fluoro-3-trifluoromethyl-benzene and 4-hydroxymethyl-phenol in the manner analogous to Examples 14A and 14B. MS  $m/z$  283 (M-237).

**Step 2. Preparation of {7-[4-(4-Fluoro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 74)**

The title compound was prepared in the manner analogous to Example 1 using 74A. mp 116-117 °C; IR (KBr)  $\text{cm}^{-1}$ : 3028, 1741, 1704, 1511, 1235, 1110; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.96 (br(s), 1H), 7.74-7.85 (m, 2H) 7.45-7.54 (m, 1H), 7.08-7.15 (m, 2H), 7.04 (d, 1H,  $J = 8.5$  Hz), 6.84-6.91 (m, 2H), 6.56 (d, 1H,  $J = 8.5$  Hz),

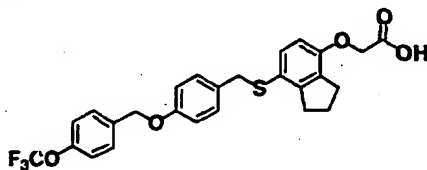
-168-

5.09 (s, 2H), 4.61 (s, 2H), 3.94 (s, 2H), 2.75 (t, 2H,  $J = 7.5$  Hz), 2.66 (t, 2H,  $J = 7.5$  Hz), 1.88 (pentet, 2H); MS  $m/z$  505 (M-1). Anal. Calc'd for  $C_{26}H_{22}F_4O_4S$ : C, 61.65; H, 4.38; found: C, 61.50; H, 4.07.

5

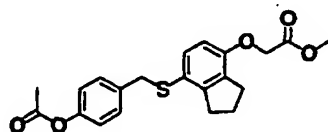
### Example 75

Synthesis of [7-[4-(4-Trifluoromethoxy-benzyloxy)-benzylsulfanyl]-indan-4-yloxy]-acetic acid (compound 75)



10

**Step 1. Preparation of [7-(4-Acetoxy-benzylsulfanyl)-indan-4-yloxy]-acetic acid methyl ester (compound 75A)**



15

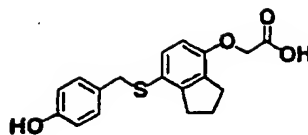
75A

The title compound was prepared in the manner analogous to Example 35A using acetic acid 4-chloromethyl-phenyl ester and 12C. MS  $m/z$  387 (M+1).

20

**Step 2. Preparation of [7-(4-Hydroxy-benzylsulfanyl)-indan-4-yloxy]-acetic acid (compound 75B)**

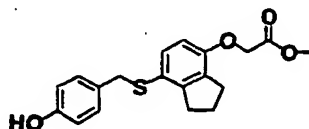
-169-



75B

The title compound was prepared in the manner analogous to **Example 35B** using  
5 75A. MS  $m/z$  391 (M-1).

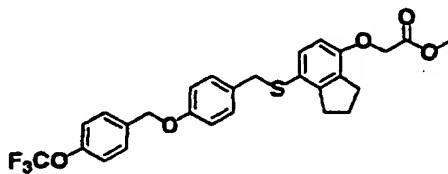
**Step 3. Preparation of [7-(4-Hydroxy-benzylsulfanyl)-indan-4-yloxy]-acetic acid  
methyl ester (compound 75C)**



75C

The title compound was prepared in the manner analogous to **Example 35C** using the  
product from **Example 75B**. MS  $m/z$  237 (M-107).

**Step 4. Preparation of {7-[4-(4-Trifluoromethoxy-benzyloxy)-benzylsulfanyl]-  
15 indan-4-yloxy}-acetic acid methyl ester (compound 75D)**



75D

The title compound was prepared in the manner analogous to **Example 1F** using 1-  
20 bromomethyl-4-trifluoromethoxy-benzene and 75C. MS  $m/z$  519 (M+1).

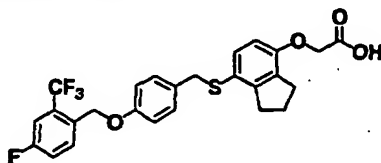
-170-

**Step 5. Preparation of {7-[4-(4-Trifluoromethoxy-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 75)**

The title compound was prepared in the manner analogous to **Example 1** using **75D**.  
mp 140-142 °C; IR (KBr)  $\text{cm}^{-1}$ : 3072, 3043, 1724, 1511, 1226, 1156; 400 MHz  $^1\text{H}$   
NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.47-7.57 (m, 2H), 7.29-7.39 (m, 2H), 7.00-  
7.16 (m, 3H), 6.81-6.91 (m, 2H), 6.56 (d, 1H,  $J = 8.5$  Hz), 5.05 (s, 2H), 4.61 (s, 2H),  
3.94 (s, 2H), 2.75 (t, 2H,  $J = 7.4$  Hz), 2.67 (t, 2H,  $J = 7.4$  Hz), 1.88 (pentet, 2H) MS  
 $m/z$  503 (M-1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{23}\text{F}_3\text{O}_5\text{S}$ : C, 61.90; H, 4.60; found: C, 61.53; H,  
4.36.

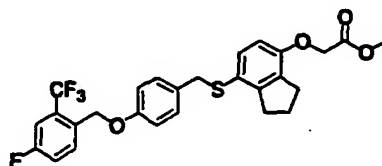
**Example 76**

**Synthesis of {7-[4-(4-Fluoro-2-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 76)**



**76**

**Step 1. Preparation of {7-[4-(4-Fluoro-2-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 76A)**



**76A**

-171-

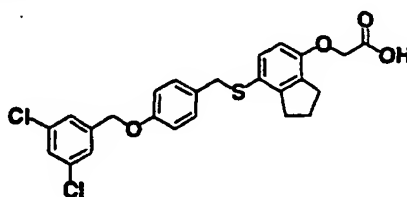
The title compound was prepared in the manner analogous to **Example 1F** using 1-bromomethyl-4-fluoro-2-trifluoromethyl-benzene and the product prepared from **Example 75C**. MS  $m/z$  283

5      **Step 2. Preparation of {7-[4-(4-Fluoro-2-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 76)**

The title compound was prepared in the manner analogous to **Example 1** using **76A**.  
mp 125-127 °C; IR (KBr)  $\text{cm}^{-1}$ : 3132, 3032, 1742, 1708, 1244, 1110; 400 MHz  $^1\text{H}$   
10      NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.71-7.81 (m, 1H), 7.65 (dd, 1H,  $J = 9.3, 2.6$   
Hz), 7.51-7.61 (m, 1H), 7.01-7.19 (m, 3H), 6.81-6.91 (m, 2H), 6.57 (d, 1H,  $J = 8.5$   
Hz), 5.11 (s, 2H), 4.61 (s, 2H), 3.95 (s, 2H), 2.75 (t, 2H,  $J = 7.4$  Hz), 2.66 (t, 2H,  $J =$   
7.4 Hz), 1.89 (pentet, 2H); MS  $m/z$  502 (M-1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{22}\text{F}_4\text{O}_4\text{S}$ : C,  
15      61.65; H, 4.38; found: C, 61.28; H, 4.12.

15                      **Example 77**

**Synthesis of {7-[4-(3,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 77)**



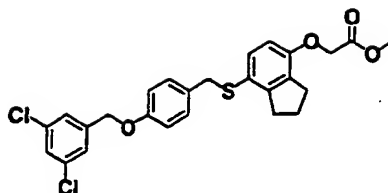
20                      **77**

**Step 1. Preparation of {7-[4-(3,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 77A)**

25



-172-



77A

5 The product from Example 75C (0.42 g, 1 mmole), (3,5-dichlorophenyl)-methanol (0.24 g, 1.3 mmole), triphenyl phosphine (0.38 g, 1.5 mmole), and 0.23 mL of diethyl azodicarboxylate (0.25 g, 1.5 mmole) were dissolved in 9 mL of tetrahydrofuran. The reaction mixture was stirred at room temperature under nitrogen for 18 hrs. The reaction mixture was evaporated to give a residue, which was flash chromatographed (silica gel, 20% ethyl acetate in hexane) to afford the title  
10 compound in good purity. MS  $m/z$  265

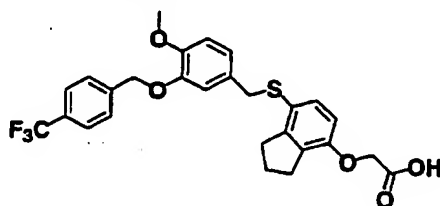
**Step 2. Preparation of {7-[4-(3,5-Dichloro-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 77)**

15 The title compound was prepared in the manner analogous to Example 1 using 77A. mp 134-135 °C; IR (KBr)  $\text{cm}^{-1}$ : 3070, 1747, 1708, 1572, 1432, 1244; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.51-7.53 (m, 1H), 7.42-7.45 (m, 2H), 7.07-7.13 (m, 2H), 7.04 (d, 1H,  $J = 8.6$  Hz), 6.83-6.90 (m, 2H), 6.56 (d, 1H,  $J = 8.6$  Hz), 5.05 (s, 2H), 4.61 (s, 2H), 3.93 (s, 2H), 2.75 (t, 2H,  $J = 7.5$  Hz), 2.66 (t, 2H, 7.5 Hz),  
20 1.88 (pentet, 2H); MS  $m/z$  487 (M-1). Anal. Calc'd for  $\text{C}_{25}\text{H}_{22}\text{Cl}_2\text{O}_4\text{S}$ : C, 61.35; H, 4.53; found: C, 61.01; H, 4.36.

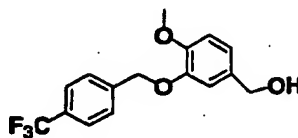
-173-

**Example 78**

5     Synthesis of [7-[4-Methoxy-3-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy]-acetic acid (compound 78)

**78**

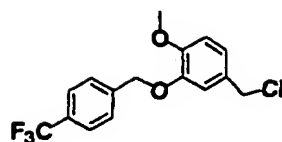
10     **Step 1. Preparation of [4-Methoxy-3-(4-trifluoromethyl-benzyloxy)-phenyl]-methanol (compound 78A)**

**78A**

15     The title compound was prepared in the manner analogous to **Example 14A** using 1-bromomethyl-4-trifluoromethyl-benzene and 5-hydroxymethyl-2-methoxy-phenol. MS  $m/z$  295 (M-OH).

20     **Step 2. Preparation of 4-Chloromethyl-1-methoxy-2-(4-trifluoromethyl-benzyloxy)-benzene (compound 78B)**

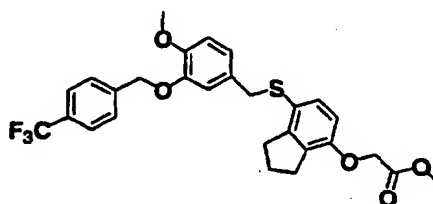
-174-



78B.

The title compound was prepared in the manner analogous to Example 3B using  
 5 78A. MS  $m/z$  295 (M-Cl).

Step 3. Preparation of {7-[4-Methoxy-3-(4-trifluoromethyl)-benzyloxy]-  
 benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 78C)



78C

The title compound was prepared in the manner analogous to Example 1F using 78B  
 and 12C. MS  $m/z$  373 (M-159).

Step 4. Preparation of {7-[4-Methoxy-3-(4-trifluoromethyl)-benzyloxy]-  
 benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 78)

The title compound was prepared in the manner analogous to Example 1 using 78C.  
 20 mp 150-151 °C; IR (KBr)  $\text{cm}^{-1}$ : 3046, 1722, 1515, 1328, 1232, 1106; 400 MHz  $^1\text{H}$   
 NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.71 (d, 2H,  $J = 8.1$  Hz), 7.58 (d, 2H,  $J = 8.1$   
 Hz), 7.03 (d, 1H,  $J = 8.5$  Hz), 6.70-6.86 (m, 3H), 6.57 (d, 1H,  $J = 8.5$  Hz), 5.01 (s,  
 2H), 4.61 (s, 2H), 3.89 (s, 2H), 3.69 (s, 3H), 2.75 (t, 2H,  $J = 7.3$  Hz), 2.62 (t, 2H,  $J =$

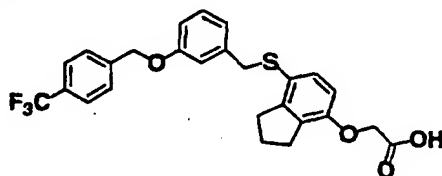
-175-

7.3 Hz), 1.87 (pentet, 2H); MS  $m/z$  517 (M-1). Anal. Calc'd for  $C_{27}H_{25}F_3O_5S$ : C, 62.54; H, 4.86; found: C, 62.54; H, 4.71.

5

**Example 79**

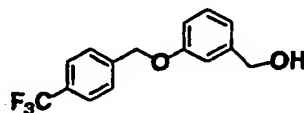
Synthesis of {7-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 79)



10

**79**

**Step 1. Preparation of [3-(4-trifluoromethyl-benzyloxy)-phenyl]-methanol (compound 79A)**



15

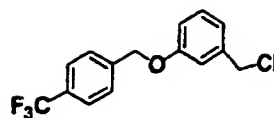
**79A**

The title compound was prepared in the manner analogous to **Example 14A** using 1-bromomethyl-4-trifluoromethyl-benzene and 3-hydroxymethyl-phenol. MS  $m/z$  265 (M-OH).

20

**Step 2. Preparation of 1-(4-trifluoromethyl-benzyloxy)-3-chloromethyl-benzene (Compound 79B)**

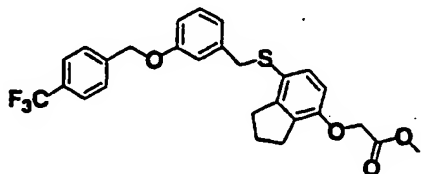
-176-



79B

5 The title compound was prepared in the manner analogous to Example 3B using 79A. MS  $m/z$  265 (M-Cl).

Step 3. Preparation of {7-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 79C)



79C

10

The title compound was prepared in the manner analogous to Example 1F using 79B and 12C. MS  $m/z$  503 (M+1).

15

Step 4. Preparation of {7-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 79)

20 The title compound was prepared in the manner analogous to Example 1 using 79C. mp 145-146 °C; IR (KBr)  $\text{cm}^{-1}$ : 3076, 3028, 1705, 1318, 1232, 1109; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.94 (br(s), 1H), 7.71 (d, 2H,  $J = 8.2$  Hz), 7.59 (d, 2H,  $J = 8.0$  Hz), 7.10-7.19 (m, 1H), 7.05 (d, 1H,  $J = 8.5$  Hz), 6.75-6.86 (m, 4H), 6.58 (d, 1H,  $J = 8.5$  Hz), 5.08 (s, 2H), 4.61 (s, 2H), 3.95 (s, 2H), 2.75 (t, 2H,  $J = 7.5$  Hz), 2.64 (t, 2H,  $J$

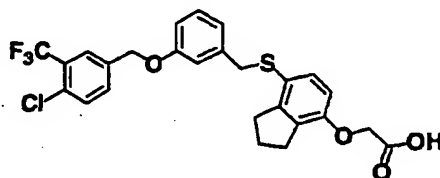
-177-

= 7.5 Hz), 1.88 (pentet, 2H); MS  $m/z$  487 (M-1). Anal. Calc'd for  $C_{26}H_{23}F_3O_4S$ : C, 63.92; H, 4.75; found: C, 63.78; H, 4.53.

5

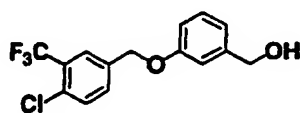
**Example 80**

**Synthesis of {7-[3-(4-Chloro-3-trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 80)**



10

**Step 1. Preparation of [3-(4-Chloro-3-trifluoromethyl-benzyloxy)-phenyl]-methanol (compound 80A)**



15

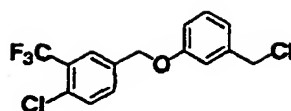
**80A**

The title compound was prepared in the manner analogous to **Example 14A** using 4-bromomethyl-1-chloro-2-trifluoromethyl-benzene and 3-hydroxymethyl-phenol. MS  $m/z$  299 (M-OH).

20

**Step 2. Preparation of 1-Chloro-4-(3-chloromethyl-phenoxy)-2-trifluoromethyl-benzene (compound 80B)**

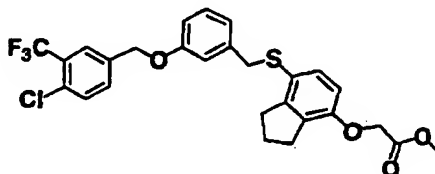
-178-



80B

The title compound was prepared in the manner analogous to Example 3B using  
 5 80A. MS  $m/z$  299 (M-Cl).

**Step 3. Preparation of {7-[3-(4-Chloro-3-trifluoromethyl-benzyloxy)-  
 benzylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 80C)**



80C

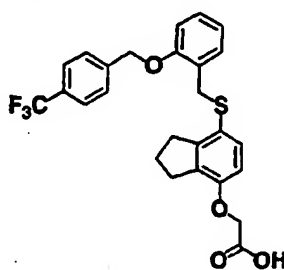
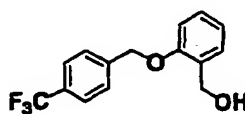
The title compound was prepared in the manner analogous to Example 1F using 80B  
 and 12C. MS  $m/z$  537 (M+1).

**Step 4. Preparation of {7-[3-(4-Chloro-3-trifluoromethyl-benzyloxy)-  
 benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 80)**

The title compound was prepared in the manner analogous to Example 1 using 80C.  
 mp 121-122 °C; IR (KBr)  $\text{cm}^{-1}$ : 3027, 2584, 1742, 1255, 1129, 1109; 400 MHz  $^1\text{H}$   
 20 NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.87 (s, 1H), 7.64-7.75 (m, 2H), 7.09-7.19  
 (m, 1H), 7.01-7.09 (m, 1H), 6.73-6.88 (m, 3H), 6.56 (d, 1H,  $J$  = 8.5 Hz), 5.06 (s, 2H),  
 4.60 (s, 2H), 3.95 (s, 2H), 2.74 (t, 2H,  $J$  = 7.4 Hz), 2.63 (t, 2H,  $J$  = 7.4 Hz), 1.87  
 (pentet, 2H); MS  $m/z$  523 (M+1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{22}\text{ClF}_3\text{O}_4\text{S}$ : C, 59.71; H,  
 4.24; found: C, 59.45; H, 4.08.

25

-179-

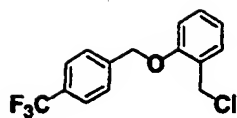
**Example 81****Synthesis of {7-[2-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy}-acetic acid (compound 81)****81****Step 1. Preparation of [2-(4-Trifluoromethyl-benzyloxy)-phenyl]-methanol (compound 81A)****81A**

The title compound was prepared in the manner analogous to **Example 14A** using 1-bromomethyl-4-trifluoromethyl-benzene and 2-hydroxymethyl-phenol. MS  $m/z$  265 (M-OH).

**Step 2. Preparation of 1-(4-trifluoromethyl-benzyloxy)-2-chloromethyl-benzene (compound 81B)**

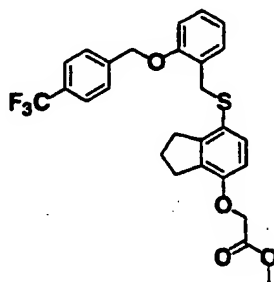


-180-

**81B**

The title compound was prepared in the manner analogous to Example 3B using  
 5 81A. MS  $m/z$  265 (M-Cl).

Step 3. Preparation of {7-[2-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-  
 indan-4-yloxy}-acetic acid methyl ester (compound 81C)

**81C**

The title compound was prepared in the manner analogous to Example 1F using 81B  
 and 12C. MS  $m/z$  503 (M+1).

Step 4. Preparation of {7-[2-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-  
 indan-4-yloxy}-acetic acid (compound 81)

The title compound was prepared in the manner analogous to Example 1 using 81C.  
 20 mp 150-152 °C; IR (KBr)  $\text{cm}^{-1}$ : 3074, 3042, 1701, 1324, 1124, 1099; 400 MHz  $^1\text{H}$   
 NMR (DMSO- $d_6$ ):  $\delta$  7.58-7.75 (m, 2H), 6.92-7.20 (m, 4H), 6.80 (t, 1H,  $J = 7.5$  Hz),  
 6.51 (d, 1H,  $J = 8.5$  Hz), 5.16 (s, 2H), 4.57 (s, 2H), 3.99 (s, 2H), 2.70 (t, 2H,  $J = 7.5$

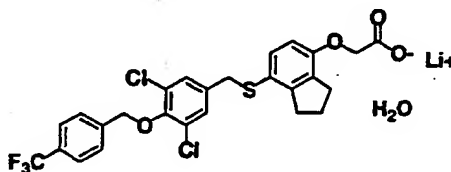
-181-

Hz), 2.62 (t, 2H,  $J = 7.5$  Hz), 1.80 (pentet, 2H); MS  $m/z$  487 (M-1). Anal. Calc'd for  $C_{26}H_{23}F_3O_4S$ : C, 63.92; H, 4.75; found: C, 63.54; H, 4.52.

5

**Example 82**

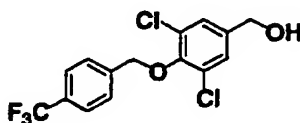
**Synthesis of {7-[3,5-Dichloro-4-(4-trifluoromethyl-benzyloxy)-benzylsulfonyl]-indan-4-yloxy}-acetic acid lithium salt (compound 82)**



82

10

**Step 1. Preparation of [3,5-Dichloro-(4-trifluoromethyl-benzyloxy)-phenyl]-methanol (compound 82A)**



82A

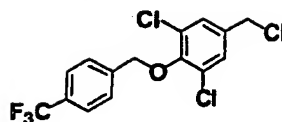
15

The title compound was prepared in the manner analogous to **Example 14A** using 1-bromomethyl-4-trifluoromethyl-benzene and 2,6-dichloro-4-hydroxymethyl-phenol. MS  $m/z$  191 (M-159).

20

**Step 2. Preparation of 1,3-Dichloro-5-chloromethyl-2-(4-trifluoromethyl-benzyloxy)-benzene (compound 82B)**

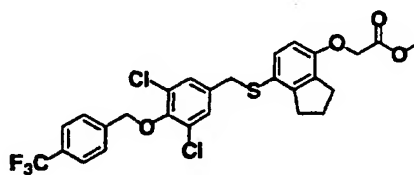
-182-



82B

The title compound was prepared in the manner analogous to Example 3B using  
5 82A. MS  $m/z$  333 (M-Cl).

Step 3. Preparation of {7-[3,5-Dichloro-4-(4-trifluoromethyl-benzyloxy)-  
benzylsulfonyl]-indan-4-yloxy}-acetic acid methyl ester (compound 82C)



82C

The title compound was prepared in the manner analogous to Example 1F using 82B  
15 and 12C. MS  $m/z$  571 (M+1).

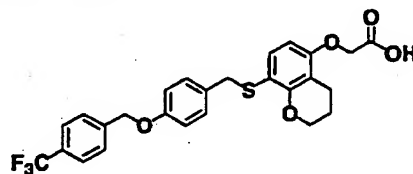
Step 4. Preparation of The Lithium Salt of {7-[3,5-Dichloro-4-(4-  
trifluoromethyl-benzyloxy)-benzylsulfonyl]-indan-4-yloxy}-acetic acid  
(compound 82)

20 The title compound, in unprotonated form, was prepared in the manner analogous to  
Example 1 using 82C. mp 235 °C dec; IR (KBr)  $\text{cm}^{-1}$ : 3414, 1622, 1591, 1472,  
1326, 1265; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ ):  $\delta$  7.66-7.77 (m, 4H), 7.26 (s, 2H), 6.99  
(d, 1H,  $J = 8.5$  Hz), 6.45 (d, 1H,  $J = 8.5$  Hz), 5.03 (s, 2H), 4.02 (s, 2H), 3.92 (s, 2H),  
2.73 (t, 2H,  $J = 7.3$  Hz), 2.65 (t, 2H,  $J = 7.3$  Hz), 1.88 (pentet, 2H); MS  $m/z$  555 (M-

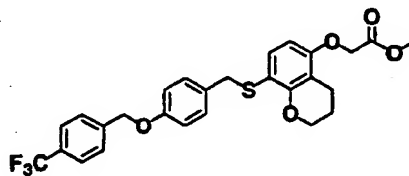
-183-

1). Anal. Calc'd for  $C_{26}H_{20}Cl_2F_3O_4S$ : Li: 0.50  $H_2O$ : C, 54.56; H, 3.70; Li, 1.21;  $H_2O$ , 1.57; found: C, 54.63; H, 3.68; Li, 1.46;  $H_2O$ , 1.61.

5

**Example 83****Synthesis of {8-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 83)****83**

10

**Step 1. Preparation of {8-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 83A)****83A**

15

The title compound was prepared in the manner analogous to **Example 1F** using (8-mercapto-chroman-5-yloxy)-acetic acid methyl ester and **14B**. MS  $m/z$  519 (M+1).

20

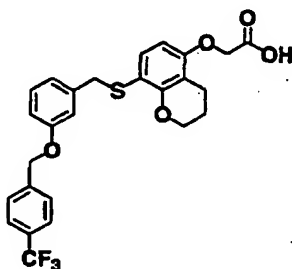
**Step 2. Preparation of {8-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 83)**

-184-

The title compound was prepared in the manner analogous to Example 1 using 83A.  
mp 143-144 °C; HPLC: area % = 96.02, r.t. = 3.770 min,  $\gamma$  = 214 nm, mobile phase =  
acetonitrile / water w/0.10% TFA; IR (KBr)  $\text{cm}^{-1}$ : 3042, 2581, 1739, 1714, 1325,  
1116; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.66-7.74 (m, 2H), 7.56-  
7.63 (m, 2H); 7.10-7.17 (m, 2H), 6.92 (d, 1H,  $J$  = 8.7 Hz), 6.83-6.89 (m, 2H), 6.26 (d,  
1H,  $J$  = 8.5 Hz), 5.13 (s, 2H), 4.58 (s, 2H), 4.08 (t, 2H,  $J$  = 4.8 Hz), 3.90 (s, 2H), 2.55  
(t, 2H,  $J$  = 6.5 Hz), 1.83 (pentet, 2H); MS  $m/z$  503 (M-1). Anal. Calc'd for  
 $\text{C}_{26}\text{H}_{23}\text{F}_3\text{O}_5\text{S}$ : C, 61.90; H, 4.60; found: C, 61.41; H, 4.50.

#### Example 84

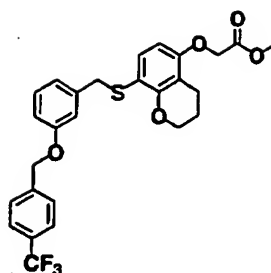
##### Synthesis of {8-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 84)



84

##### **Step 1. Preparation of {8-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 84A)**

-185-



84A

5 The title compound was prepared in the manner analogous to Example 1F using (8-mercapto-chroman-5-yloxy)-acetic acid methyl ester and 79B. MS  $m/z$  519 (M+1).

**Step 2. Preparation of {8-[3-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 84)**

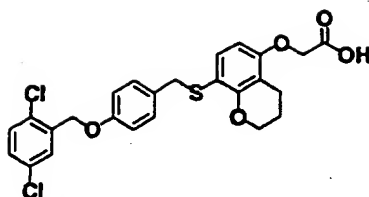
10 The title compound was prepared in the manner analogous to Example 1 using 84A.  
mp 113-115 °C; HPLC: area % = 97.30, r.t. = 3.140 min,  $\gamma$  = 214 nm, mobile phase =  
acetonitrile / water w/0.10% TFA; IR (KBr)  $\text{cm}^{-1}$ : 2952, 2577, 1742, 1582, 1323,  
1120; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  7.67-7.74 (m, 2H), 7.56-7.63 (m, 2H); 7.13  
(t, 1H,  $J$  = 7.8 Hz), 6.76-6.93 (m, 4H), 6.22 (d, 1H,  $J$  = 8.7 Hz), 5.08 (s, 2H), 4.45 (s,  
15 2H), 4.08 (t, 2H,  $J$  = 4.8 Hz), 3.91 (s, 2H), 2.54 (t, 2H,  $J$  = 6.6 Hz), 1.82 (pentet, 2H);  
MS  $m/z$  505 (M+1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{23}\text{F}_3\text{O}_5\text{S}$ : C, 61.90; H, 4.60; found: C,  
61.49; H, 4.44.

20

**Example 85**

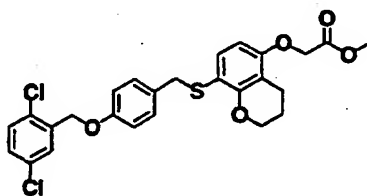
**Synthesis of {8-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 85)**

-186-



85

Step 1. Preparation of {8-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 85A)



85A

The title compound was prepared in the manner analogous to Example 1F using (8-mercapto-chroman-5-yloxy)-acetic acid methyl ester and 1,4-Dichloro-2-(4-chloromethyl-phenoxy)methyl)-benzene prepared in the manner analogous to Example 71A.  $m/z$  519 ( $M+1$ ).

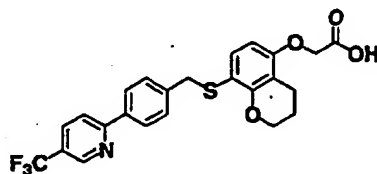
Step 2. Preparation of {8-[4-(2,5-Dichloro-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 85)

The title compound was prepared in the manner analogous to Example 1 using 85A. mp 98-100 °C; IR (KBr)  $\text{cm}^{-1}$ : 3038, 2854, 1729, 1508, 1240, 1124; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ ):  $\delta$  12.95 (br(s), 1H), 7.57-7.62 (m, 1H), 7.39-7.53 (m, 2H); 7.12-7.20 (m, 2H), 6.84-6.96 (m, 3H), 6.26 (d, 1H,  $J = 8.6$  Hz), 5.05 (s, 2H), 4.58 (s, 2H), 4.09 (t, 2H,  $J = 4.9$  Hz), 3.92 (s, 2H), 2.55 (t, 2H,  $J = 6.5$  Hz), 1.83 (pentet, 2H); MS

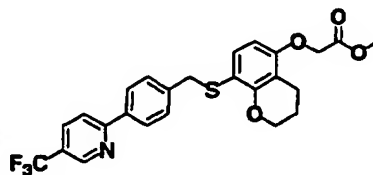
-187-

$m/z$  503 (M-1). Anal. Calc'd for  $C_{25}H_{22}Cl_2O_5S$ : C, 59.41; H, 4.39; found: C, 59.20; H, 4.20.

5

**Example 86****Synthesis of {8-[4-(5-Trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 86)**

10

**86****Step 1. {8-[4-(5-Trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 86A)**

15

**86A**

The title compound was prepared in the manner analogous to **Example 1F** using (8-mercapto-chroman-5-yloxy)-acetic acid methyl ester and **18B**. MS  $m/z$  490 (M+1).

20

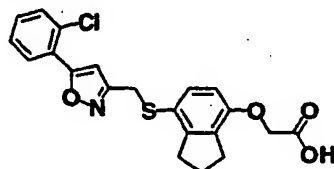
**Step 2. {8-[4-(5-Trifluoromethyl-pyridine-2-yl)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 86)**



-188-

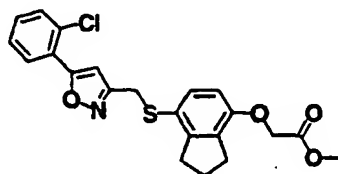
The title compound was prepared in the manner analogous to Example 1 using 86A. mp 178-179 °C; IR (KBr)  $\text{cm}^{-1}$ : 3034, 2577, 1707, 1604, 1332, 1111; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.95 (br(s), 1H), 8.97 (s, 1H), 7.99-8.24 (m, 4H), 7.33-7.40 (m, 2H), 6.95 (d, 2H,  $J = 8.5$  Hz), 6.26 (d, 2H,  $J = 8.6$  Hz), 4.57 (s, 2H), 4.11 (t, 2H,  $J = 4.9$  Hz), 4.04 (s, 2H), 2.56 (t, 2H,  $J = 6.5$  Hz), 1.84 (pentet, 2H); MS  $m/z$  476 (M+1). Anal. Calc'd for  $\text{C}_{24}\text{H}_{20}\text{F}_3\text{NO}_4\text{S}$ : C, 60.63; H, 4.24; N, 2.95; found: C, 60.31; H, 4.24; N, 3.02.

10

**Example 87****Synthesis of {7-[5-(2-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 87)**

15

87

**Step 1. Preparation of {7-[5-(2-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 87A)**

20

87A

-189-

The title compound was prepared in the manner analogous to Example 1F using commercially available 3-chloromethyl-5-(2-chloro-phenyl)-isoxazole and 12C. MS  $m/z$  430 (M+1).

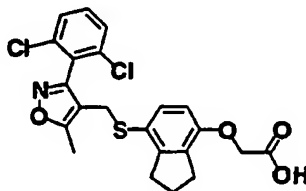
5      **Step 2. Preparation of {7-[5-(2-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 87)**

The title compound was prepared in the manner analogous to Example 1 using 87A. mp 161-162 °C; IR (KBr)  $\text{cm}^{-1}$ : 3177, 3065, 1706, 1475, 1432, 1233; 400 MHz  $^1\text{H}$   
10      NMR (DMSO- $d_6$ ):  $\delta$  13.00 (bs, 1H), 7.78-7.85 (m, 1H), 7.58-7.64 (m, 1H), 7.42-7.53 (m, 2H), 7.15 (d, 1H,  $J = 8.6$  Hz), 6.84 (s, 1H), 6.60 (d, 1H,  $J = 8.6$  Hz), 4.62 (s, 2H), 4.09 (s, 2H), 2.72-2.82 (m, 4H), 1.91 (pentet, 2H); MS  $m/z$  416 (M+1). Anal. Calc'd for  $\text{C}_{21}\text{H}_{18}\text{ClNO}_4\text{S}$ : C, 60.65; H, 4.36; N, 3.37; found: C, 60.56; H, 4.28; N, 3.16.

15

**Example 88**

**Synthesis of {7-[3-(2,6-Dichloro-phenyl)-5-methyl-isoxazol-4-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 88)**

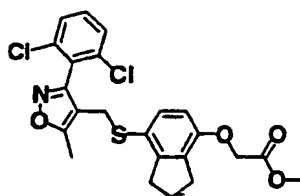


88

20  
**Step 1. Preparation of {7-[3-(2,6-Dichloro-phenyl)-5-methyl-isoxazol-4-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 88A)**

25

-190-



88A

5 The title compound was prepared in the manner analogous to **Example 1F** using commercially available 4-bromomethyl-3-(2,6-dichloro-phenyl)-5-methyl-isoxazole and **12C**. MS  $m/z$  478 (M+1).

**Step 2. Preparation of {7-[3-(2,6-Dichloro-phenyl)-5-methyl-isoxazol-4-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 88)**

10

The title compound was prepared in the manner analogous to **Example 1** using **88A**. mp 151-152 °C; IR (KBr)  $\text{cm}^{-1}$ : 3084, 1743, 1430, 1277, 1245, 1106; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ ):  $\delta$  12.97 (br(s), 1H), 7.47-7.70 (m, 3H), 6.90 (d, 1H,  $J = 8.5$  Hz), 6.52 (d, 1H,  $J = 8.5$  Hz), 4.63 (s, 2H), 3.58 (s, 2H), 2.75 (t, 2H,  $J = 7.6$  Hz), 2.65 (t, 2H,  $J = 7.6$  Hz), 2.07 (s, 3H), 1.89 (pentet, 2H) MS  $m/z$  464 (M+1). Anal. Calc'd for  $\text{C}_{22}\text{H}_{19}\text{Cl}_2\text{NO}_4\text{S}$ : C, 56.90; H, 4.12; N, 3.02; found: C, 56.51; H, 3.96; N, 2.95.

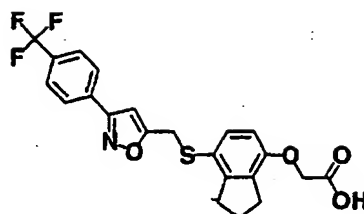
15

**Example 89**

20

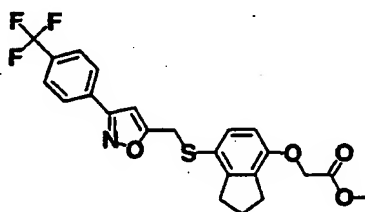
**Synthesis of {7-[3-(4-Trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 89)**

-191-



89

**Step 1. Preparation of {7-[3-(4-Trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 89A)**



89A

The title compound was prepared in the manner analogous to **Example 1F** using **42C** and **12C**. MS  $m/z$  464 ( $M+1$ ).

**Step 2. Preparation of {7-[3-(4-Trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 89)**

15

The title compound was prepared in the manner analogous to **Example 1** using **89A**. mp 166-168 °C; HPLC: area % = 96.95, r.t. = 3.140 min,  $\gamma$  = 214 nm, mobile phase = acetonitrile / water w/0.10% TFA. IR (KBr)  $\text{cm}^{-1}$ : 3140, 3085, 1742, 1322, 1255, 1109; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ ):  $\delta$  12.96 (br(s), 1H), 7.99 (d, 2H,  $J$  = 8.3 Hz), 7.81 (d, 2H,  $J$  = 8.3 Hz), 7.14 (d, 1H,  $J$  = 8.4 Hz), 6.81 (s, 1H), 6.61 (d, 1H,  $J$  = 8.4 Hz), 4.63 (s, 2H), 4.23 (s, 2H), 2.76 (t, 4H,  $J$  = 7.5 Hz), 1.91 (pentet, 2H); MS  $m/z$

20

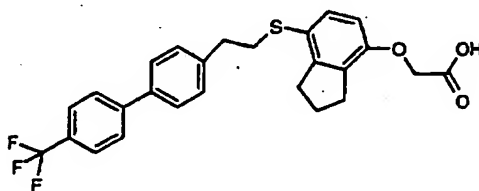
-192-

450 (M+1). Anal. Calc'd for  $C_{22}H_{18}F_3NO_4S$ : C, 58.79; H, 4.04; N, 3.12; found: C, 58.38; H, 3.92; N, 2.95.

5

**Example 90**

**Synthesis of {7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 90)**

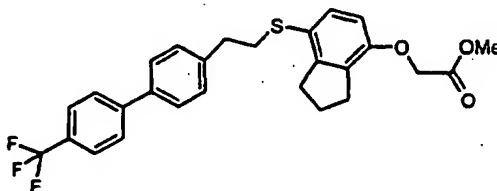


10

90

15

**Step 1. Preparation of {7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 90A)**



90A

20

The title compound was prepared in the manner analogous to **Example 1F** using **12C** and 4-(2-bromo-ethyl)-4'-trifluoromethyl-biphenyl (compound **22B**). MS  $m/z$  487 (M+1).

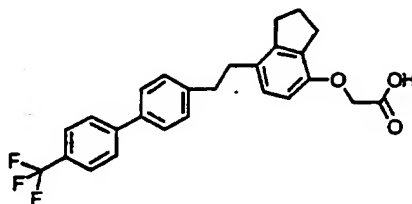
-193-

**Step 2. Preparation of (7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-indan-4-yloxy)-acetic acid (compound 90)**

5 The title compound was prepared in the manner analogous to **Example 1** using **90A**. mp 170-172 °C; IR (thin film)  $\text{cm}^{-1}$ : 1724, 1471, 1327, 1239, 1175, 1110; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.96 (br s, 1H), 7.82 (d, 2H,  $J = 8.3$  Hz), 7.74 (d, 2H,  $J = 8.3$  Hz), 7.61 (d, 2H,  $J = 8.3$  Hz), 7.31 (d, 2H,  $J = 8.3$  Hz), 7.12 (d, 2H,  $J = 8.5$  Hz), 6.62 (d, 1H,  $J = 8.5$  Hz), 4.63 (s, 2H), 3.08 (t, 2H,  $J = 7.6$  Hz), 2.80 (m, 6H), 1.96 (m, 2H);  
10 MS  $m/z$  471 (M-1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{23}\text{F}_3\text{O}_3\text{S}$ : C, 66.09; H, 4.91; found: C, 65.95; H, 4.63.

**Example 91**

Synthesis of (7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethyl]-indan-4-yloxy)-acetic acid (compound 91)  
15

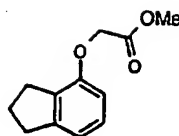


**91**

20

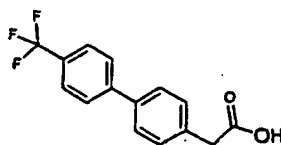
**Step 1. Preparation of (Indan-4-yloxy)-acetic acid methyl ester (compound 91A)**

-194-

**91A**

Compound **91A** was prepared from indan-4-ol and bromo-acetic acid methyl ester in the manner analogous to Example 1C. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.00 (t, 1H,  $J = 7.8$  Hz), 6.79 (d, 1H,  $J = 7.3$  Hz), 6.56 (d, 1H,  $J = 8.1$  Hz), 4.74 (s, 2H), 3.63 (s, 3H), 2.77 (m, 4H), 1.95 (m, 2H).

**Step 2. Preparation of (4'-Trifluoromethyl-biphenyl-4-yl)-acetic acid (compound 91B)**

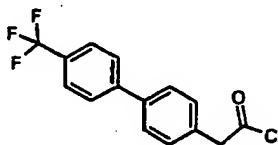
**91B**

A mixture of (4-bromo-phenyl)-acetic acid (10.2 g, 47.4 mmol), 4-trifluoromethylphenylboronic acid (10.0 g, 52.7 mmol), and 50% water-wet 5% palladium on charcoal catalyst (4.6 g) in 50 ml of water and 8.0 ml of 2-propanol was treated dropwise over 30 minutes with a solution of sodium carbonate (6.8 g, 64.2 mmol) in 18 ml of water. The mixture was heated at 65-70°C for 3 h, then cooled to 40°C and treated with 13.0 ml of a solution of 2-propanol/water/2.0 N aqueous sodium hydroxide solution (70/15/1). The reaction mixture was filtered through a bed of Celite filter-aid, and the filter cake was washed 5x with the above 2-propanol/water/2.0 N aqueous sodium hydroxide solution. The combined filtrates were diluted with 125 ml of water, and the solution was digested on the steam bath with charcoal and filtered. The filtrate was diluted with an additional 150 ml of water

-195-

and made strongly acidic by the addition of 4.0 N hydrochloric acid. The precipitated product was filtered and suspended in 350 ml of water plus 50 ml of methanol. The new mixture was stirred for several hours and filtered again. The crude product was recrystallized from aqueous acetonitrile. A sample recrystallized a second time from aqueous acetonitrile had mp 158-160°C; MS  $m/z$  280 (M).

**Step 3. Preparation of (4'-Trifluoromethyl-biphenyl-4-yl)-acetyl chloride (compound 91C)**

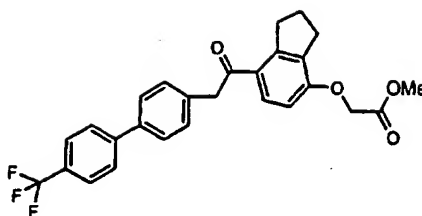
**91C**

A suspension **91B** (2.0 g, 7.1 mmol) and 5 drops of *N, N*-dimethylformamide in 30 ml of dichloromethane was cooled in ice and treated dropwise with a solution of oxalyl chloride (0.70 ml, 1.0 g, 8.0 mmol) in 10 ml of dichloromethane. The ice bath was removed, and the mixture was stirred at room temperature for 3 h. The solution was filtered, and the filtrate was evaporated. The residue quickly crystallized to yield the acid chloride intermediate, which was used immediately in the next step.

**Step 4. Preparation of {7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-acetyl]-indan-4-yloxy}-acetic acid methyl ester (compound 91D)**

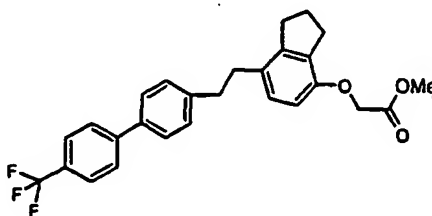


-196-

**91D**

A solution of **91C** (2.1 g, 7.0 mmol) in 25 ml of 1,2-dichloro-ethane was cooled in ice  
5 and treated with anhydrous ferric chloride (1.2 g, 7.4 mmol). The mixture was  
stirred, and a solution of **91A** (1.5 g, 7.3 mmol) in 10 ml of 1,2-dichloro-ethane was  
added dropwise. The mixture was stirred at room temperature for 18 h. The reaction  
mixture was added to 300 g of ice and of brine and extracted with ethyl acetate  
(4x100 ml). The combined extracts were washed with 5% aqueous sodium  
10 bicarbonate solution (4x250 ml) and brine (1x250 ml), then dried over anhydrous  
sodium sulfate and concentrated. The crude product was purified by normal phase  
chromatography. A sample recrystallized from ethyl acetate/hexane had mp 141-143  
°C; MS *m/z* 467 (M-1).

15 **Step 5. Preparation of {7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethyl]-indan-4-  
yloxy}-acetic acid methyl ester (compound 91E)**

**91E**

20

-197-

A solution of **91D** (1.0 g, 2.1 mmol) in 10.0 ml of trifluoroacetic acid was treated dropwise with triethylsilane (1.5 ml, 1.1 g, 9.4 mmol). The mixture was stirred at room temperature for 3 h and then added to 200 g of ice and water. The precipitated solid was extracted out with ethyl acetate (4x100 ml). The combined extracts were washed with brine (1x250 ml), 5% aqueous sodium bicarbonate solution (4x250 ml), and brine again, then dried over anhydrous sodium sulfate and concentrated. The crude product was purified by normal phase chromatography. 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 7.82 (d, 2H, J = 8.3 Hz), 7.75 (d, 2H, J = 8.3 Hz), 7.61 (d, 2H, J = 8.3 Hz), 7.30 (d, 2H, J = 8.3 Hz), 6.90 (d, 1H, J = 8.3 Hz), 6.53 (d, 1H, J = 8.3 Hz), 4.71 (s, 2H), 3.63 (s, 2H), 2.77 (m, 8H), 1.94 (m, 2H).

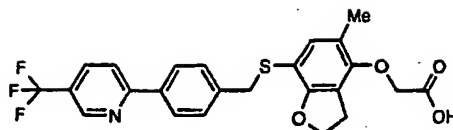
**Step 6. Preparation of {7-[2-(4'-Trifluoromethyl-biphenyl-4-yl)-ethyl]-indan-4-yloxy}-acetic acid (compound 91)**

The title compound was prepared in the manner analogous to **Example 1** using **91E**. mp 188-190 °C; IR (thin film) cm<sup>-1</sup>: 1745, 1322, 1252, 1170, 1112, 1071; 400 MHz <sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 12.89 (br s, 1H), 7.83 (d, 2H, J = 8.1 Hz), 7.74 (d, 2H, J = 8.5 Hz), 7.61 (d, 2H, J = 8.1 Hz), 7.30 (d, 2H, J = 8.3 Hz), 6.90 (d, 1H, J = 8.3 Hz), 6.51 (d, 1H, J = 8.3 Hz), 4.58 (s, 2H), 2.75 (m, 8H), 2.45 (m, 2H); MS *m/z* 439 (M-1).  
Anal. Calc'd for C<sub>26</sub>H<sub>23</sub>F<sub>3</sub>O<sub>3</sub>: C, 70.90; H, 5.26; found: C, 70.92; H, 5.01.

**Example 92**

Synthesis of {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-2,3-dihydro-benzofuran-4-yloxy}-acetic acid (compound 92)

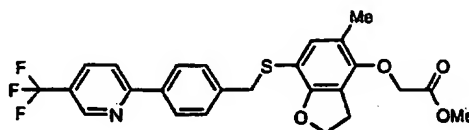
-198-



92

5

**Step 1. Preparation of {5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-2,3-dihydro-benzofuran-4-yloxy}-acetic acid methyl ester (compound 92A)**



92A

10

15

The title compound was prepared in the manner analogous to **Example 1F** using **18B** and 7-mercapto-5-methyl-2,3-dihydro-benzofuran-4-yloxy)-acetic acid methyl ester (prepared in a similar manner as described for **Example 12C**). mp 94-95 °C; MS  $m/z$  490 ( $M+1$ ).

20

**Step 2. Preparation of (5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-2,3-dihydro-benzofuran-4-yloxy)-acetic acid (compound 92)**

25

The title compound was prepared in the manner analogous to **Example 1** using **92A**. mp 155-157 °C; IR (thin film)  $\text{cm}^{-1}$ : 1732, 1587, 1416, 1331, 1211, 1129; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.89 (br s, 1H), 8.97 (m, 1H), 8.21 (dd, 1H,  $J = 2.0, 8.5$  Hz), 8.12 (d, 1H,  $J = 8.3$  Hz), 8.02 (d, 2H,  $J = 8.3$  Hz), 7.34 (d, 2H,  $J = 8.5$  Hz), 6.83 (s, 1H), 4.56 (s, 2H), 4.48 (t, 2H,  $J = 8.7$  Hz), 4.08 (s, 2H), 3.24 (t, 2H,  $J = 8.7$  Hz), 2.02

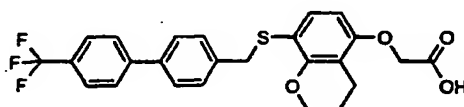
-199-

(s, 3H); MS  $m/z$  474 (M-1). Anal. Calc'd for  $C_{24}H_{20}F_3NO_4S$ : C, 60.63; H, 4.24; N, 2.95; found: C, 60.54; H, 4.19; N, 2.94.

**Example 93**

5

**Synthesis of [8-(4'-Trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-chroman-5-yloxy]-acetic acid (compound 93)**

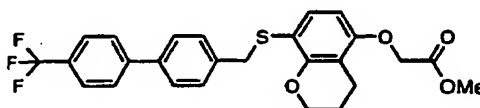


10

**93**

**Step 1. Preparation of [8-(4'-Trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-chroman-5-yloxy]-acetic acid methyl ester (compound 93A)**

15

**93A**

20 The title compound was prepared in the manner analogous to **Example 1F** using **18B** and (8-mercapto-chroman-5-yloxy)-acetic acid methyl ester. mp 122-124 °C; MS  $m/z$  489 (M+1).

**Step 2. Preparation of [8-(4'-Trifluoromethyl-biphenyl-4-yl)methylsulfanyl]-chroman-5-yloxy]-acetic acid (compound 93)**

25

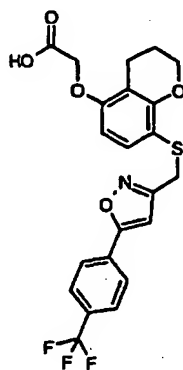
-200-

The title compound was prepared in the manner analogous to Example 1 using 93A.  
mp 170-172 °C; IR (thin film)  $\text{cm}^{-1}$ : 1717, 1584, 1473, 1330, 1231, 1118; 400 MHz  
 $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.94 (br s, 1H), 7.82 (d, 2H,  $J = 8.1$  Hz), 7.74 (d, 2H,  $J = 8.5$   
5 Hz), 7.60 (d, 2H,  $J = 8.3$  Hz), 7.34 (d, 2H,  $J = 8.3$  Hz), 6.96 (d, 2H,  $J = 8.8$  Hz), 6.28  
(d, 2H,  $J = 8.8$  Hz), 4.58 (s, 2H), 4.11 (t, 2H,  $J = 5.0$  Hz), 4.03 (s, 2H), 2.56 (t, 2H,  $J =$   
6.5 Hz), 1.84 (m, 2H); MS  $m/z$  473 (M-1). Anal. Calc'd for  $\text{C}_{25}\text{H}_{21}\text{F}_3\text{O}_4\text{S}$ : C, 63.28;  
H, 4.46; found: C, 63.28; H, 4.26.

10

**Example 94**

**Synthesis of {8-[5-(4-Trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-  
chroman-5-yloxy}-acetic acid (compound 94)**



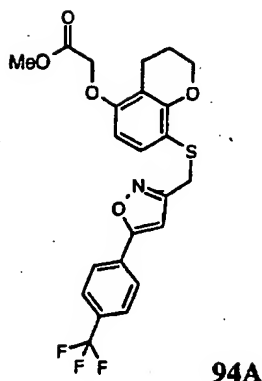
15

**94**

**Step 1. Preparation of {8-[5-(4-Trifluoromethyl-phenyl)-isoxazol-3-  
ylmethylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 94A)**

20

-201-



The title compound was prepared in the manner analogous to **Example 1F** using **42C** and (8-mercapto-chroman-5-yloxy)-acetic acid methyl ester. mp 112-113 °C; MS  $m/z$  480 (M+1).

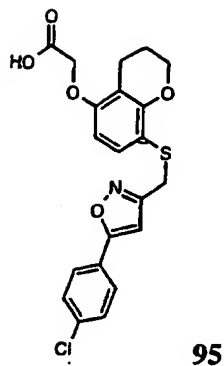
**Step 2. Preparation of {8-[5-(4-Trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 94)**

The title compound was prepared in the manner analogous to **Example 1** using **94A**. The crude product was recrystallized from ethyl acetate/hexane to yield the final product. mp 171-173 °C; IR (thin film)  $\text{cm}^{-1}$ : 1722, 1432, 1322, 1232, 1103, 1065; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO-}d_6$ )  $\delta$  12.94 (br s, 1H), 8.01 (d, 2H,  $J = 8.1$  Hz), 7.84 (d, 2H,  $J = 8.3$  Hz), 7.09 (s, 1H), 7.03 (d, 1H,  $J = 8.5$  Hz), 6.29 (d, 1H,  $J = 8.5$  Hz), 4.59 (s, 2H), 4.08 (t, 2H,  $J = 5.0$  Hz), 4.04 (s, 2H), 2.55 (t, 2H,  $J = 6.5$  Hz), 1.83 (m, 2H); MS  $m/z$  464 (M-1). Anal. Calc'd for  $\text{C}_{22}\text{H}_{18}\text{F}_3\text{NO}_5\text{S}$ : C, 56.77; H, 3.90; N, 3.01; found: C, 56.80; H, 3.58; N, 3.07.

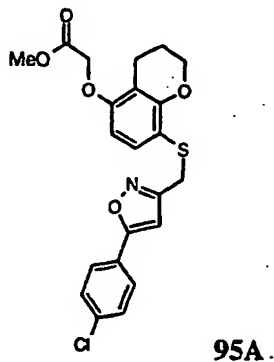
**Example 95**

**Synthesis of {8-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 95)**

-202-



- 5      **Step 1. Preparation of {8-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 95A)**

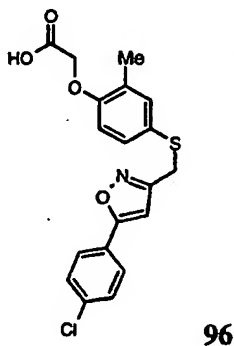


- 10      The title compound was prepared in the manner analogous to **Example 1F** using 3-chloromethyl-5-(4-chloro-phenyl)-isoxazole and (8-mercapto-chroman-5-yloxy)-acetic acid methyl ester. mp 131-133 °C; MS *m/z* 446 (M+1).

- 15      **Step 2. Preparation of {8-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 95)**

-203-

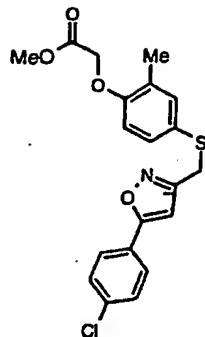
The title compound was prepared in the manner analogous to **Example 1** using **95A**. mp 181-183 °C; IR (thin film)  $\text{cm}^{-1}$ : 1723, 1612, 1479, 1428, 1231, 1134; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.95 (br s, 1H), 7.82 (m, 2H), 7.54 (m, 2H), 7.02 (d, 1H,  $J = 8.8$  Hz), 6.94 (s, 1H), 6.29 (d, 1H,  $J = 8.5$  Hz), 4.59 (s, 2H), 4.08 (t, 2H,  $J = 5.0$  Hz), 4.01 (s, 2H), 2.55 (t, 2H,  $J = 6.6$  Hz), 1.83 (m, 2H); MS  $m/z$  430 (M-1).  
Anal. Calc'd for  $\text{C}_{21}\text{H}_{18}\text{ClNO}_5\text{S}$ : C, 58.40; H, 4.20; N, 3.24; found: C, 58.30; H, 3.91; N, 3.28.

**Example 96****Synthesis of {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 96)**

**Step 1. Preparation of {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid methyl ester (compound 96A)**



-204-



96A

The title compound was prepared in the manner analogous to **Example 1F** using 3-chloromethyl-5-(4-chloro-phenyl)-isoxazole and **2C**. mp 79-80 °C; MS  $m/z$  404 (M+1).

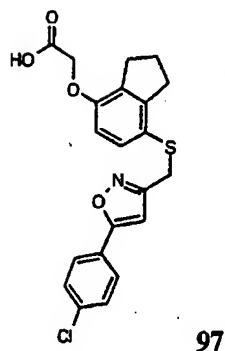
**Step 2. Preparation of {4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid (compound 96)**

- 10 The title compound was prepared in the manner analogous to **Example 1** using **96A**. mp 152-153 °C; IR (thin film)  $\text{cm}^{-1}$ : 1724, 1495, 1433, 1309, 1225, 1196; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  12.96 (br s, 1H), 7.82 (m, 2H), 7.54 (m, 2H), 7.19 (d, 1H,  $J = 1.5$  Hz), 7.12 (dd, 1H,  $J = 2.1, 8.4$  Hz), 6.97 (s, 1H), 6.72 (d, 1H,  $J = 8.5$  Hz), 4.63 (s, 2H), 4.11 (s, 2H), 2.09 (s, 3H); MS  $m/z$  388 (M-1).
- 15 Anal. Calc'd for  $\text{C}_{19}\text{H}_{16}\text{ClNO}_4\text{S}$ : C, 58.54; H, 4.14; N, 3.59; found: C, 58.53; H, 4.08; N, 3.50.

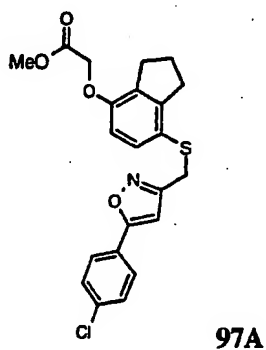
**Example 97**

- 20 Synthesis of {7-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 97)

-205-



5      **Step 1. Preparation of {7-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 97A)**



10      The title compound was prepared in the manner analogous to **Example 1F** using 3-chloromethyl-5-(4-chloro-phenyl)-isoxazole and 12C. mp 112-114 °C; MS *m/z* 430 (M+1).

15      **Step 2. Preparation of {7-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 97) .**

The title compound was prepared in the manner analogous to **Example 1** using 97A. mp 157-159 °C; IR (thin film) cm<sup>-1</sup>: 1731, 1612, 1465, 1433, 1231, 1110; 400 MHz

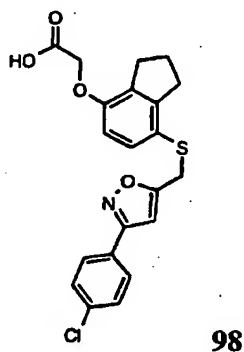
-206-

<sup>1</sup>H NMR (DMSO-*d*<sub>6</sub>) δ 7.81 (m, 2H), 7.54 (m, 2H), 7.10 (d, 1H, J = 8.3 Hz), 6.95 (s, 1H), 6.59 (d, 1H, J = 8.5 Hz), 4.62 (s, 2H), 4.06 (s, 2H), 2.77 (m, 4H), 1.92 (m, 2H); MS *m/z* 414 (M-1). Anal. Calc'd for C<sub>21</sub>H<sub>18</sub>ClNO<sub>4</sub>S: C, 60.65; H, 4.36; N, 3.37; found: C, 60.62; H, 4.10; N, 3.31.

5

**Example 98****Synthesis of {7-[3-(4-Chloro-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid (compound 98)**

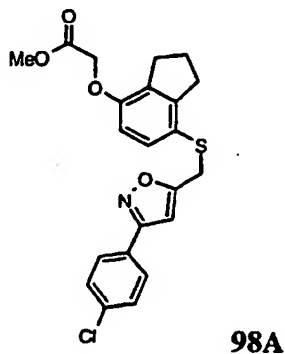
10



98

**Step 1. Preparation of {7-[3-(4-Chloro-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid methyl ester (compound 98A)**

15



98A

-207-

The title compound was prepared in the manner analogous to **Example 1F** using 5-chloromethyl-3-(4-chloro-phenyl)-isoxazole and **12C**. mp 92-94 °C; MS *m/z* 430 (M+1).

5

**Step 2. Preparation of {7-[3-(4-Chloro-phenyl)-isoxazol-5-ylmethylsulfanyl]-indan-4-yloxy}-acetic acid**

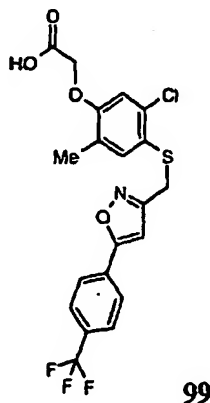
The title compound was prepared in the manner analogous to **Example 1** using **98A**. mp 158-160 °C; IR (thin film)  $\text{cm}^{-1}$ : 1741, 1574, 1476, 1429, 1252, 1110; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.78 (m, 2H), 7.51 (m, 2H), 7.13 (d, 1H,  $J = 8.6$  Hz), 6.72 (s, 1H), 6.60 (d, 1H,  $J = 8.5$  Hz), 4.62 (s, 2H), 4.20 (s, 2H), 2.76 (m, 4H), 1.91 (m, 2H); MS *m/z* 414 (M-1). Anal. Calc'd for  $\text{C}_{21}\text{H}_{18}\text{ClNO}_4\text{S}$ : C, 60.65; H, 4.36; N, 3.37; found: C, 60.55; H, 4.17; N, 3.34.

15

**Example 99**

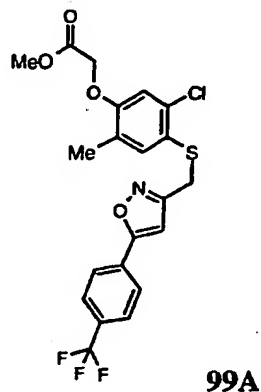
**Synthesis of {5-Chloro-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 99)**

20



-208-

**Step 1. Preparation of {5-Chloro-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid methyl ester (compound 99A)**



5

The title compound was prepared in the manner analogous to **Example 1F** using 3-chloromethyl-5-(4-chloro-phenyl)-isoxazole and **20C**. mp 120-121 °C; MS *m/z* 472 (M+1).

10

**Step 2. Preparation of {5-Chloro-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy}-acetic acid (compound 99)**

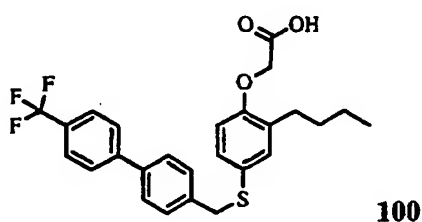
The title compound was prepared in the manner analogous to **Example 1** using **99A**. mp 180-182 °C; IR (thin film)  $\text{cm}^{-1}$ : 1743, 1484, 1325, 1236, 1165, 1111; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  13.03 (br s, 1H), 8.03 (d, 2H,  $J = 8.1$  Hz), 7.84 (d, 2H,  $J = 8.3$  Hz), 7.33 (s, 1H), 7.14 (s, 1H), 6.96 (s, 1H), 4.71 (s, 2H), 4.23 (s, 2H), 2.07 (s, 3H); MS *m/z* 456 (M-1). Anal. Calc'd for  $\text{C}_{20}\text{H}_{15}\text{ClF}_3\text{NO}_4\text{S}$ : C, 52.47; H, 3.30; N, 3.06; found: C, 52.39; H, 3.02; N, 2.86.

15

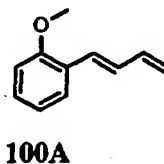
-209-

## Example 100

5 Synthesis of 2-[2-butyl-4-({4-[4-(trifluoromethyl)phenyl]phenyl}methylthio)phenoxy]acetic acid (compound 100)



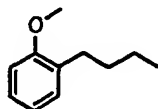
10 **Step 1. Preparation of 2-((1E)buta-1,3-dienyl)-1-methoxybenzene (compound 100A)**



15 Methyltriphenylphosphonium bromide (42.9 g, 0.12 mol) was suspended in 400 ml of anhydrous THF under nitrogen and cooled to -78 °C. Sodium hydride (60% in mineral oil, 6.0 g, 0.15 mol) was added portionwise. The reaction mixture was allowed to warm up slowly to room temperature and stirred at the same temperature for 1 h, then 2-methoxycinnamaldehyde (16.2 g, 0.10 mol) in 200 ml of THF was added dropwise at room temperature, and stirred at the same temperature for 3 h.

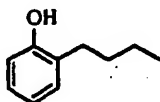
20 Water (200 ml) and diethyl ether (800 ml) were added. The organic layer was separated, dried over sodium sulfate, concentrated, and purified using normal phase chromatography to afford the title product. 400 MHz <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 7.48-6.56 (m, 7H), 5.32 (d, 1H), 5.16 (d, 1H), 3.84 (s, 3H).

-210-

**Step 2. Preparation of 2-butyl-1-methoxybenzene (compound 100B)****100B**

5 A mixture of the product from example 100A (12.8 g, 0.08 mol) and palladium/carbon (10%, 50% water, 12 g) in 400 ml of ethyl acetate was hydrogenated at 50 psi, at room temperature overnight, then filtered through Celite<sup>®</sup>, and concentrated to give 100B. 400 MHz <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 7.16 (m, 2H), 6.85 (m, 2H), 3.81 (s, 3H), 2.61 (m, 2H), 1.57 (m, 2H), 1.38 (m, 2H), 0.92 (t, 3H).

10

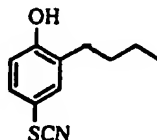
**Step 3. Preparation of 2-butylphenol (compound 100C)****100C**

15

To a stirred solution of the product from example 100B (13.1 g, 0.08 mol) in 400 ml of dichloromethane at -78 °C was added dropwise a solution of boron tribromide (100.2 g, 0.4 mol) in 200 ml of dichloromethane. After the completion of addition of boron tribromide, the reaction mixture was maintained at -78 °C for 1 h, then  
20 allowed to reach room temperature and stirred at the same temperature overnight. The mixture was cooled to 0 °C, and carefully quenched with 100 ml of water. The mixture was extracted with ethyl acetate, washed with brine, dried over sodium sulfate, and concentrated to give 100C. 400 MHz <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 7.10 (m, 2H), 6.86 (m, 1H), 6.78 (d, 1H), 4.61 (brs, 1H), 2.61 (m, 2H), 1.60 (m, 2H), 1.40 (m, 2H),  
25 0.96 (t, 3H).

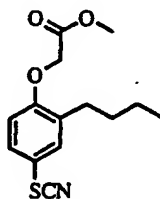
-211-

**Step 4. Preparation of (3-butyl-4-hydroxyphenyl)thiocarbonitrile (compound 100D)**

**100D**

The title compound was prepared in the manner analogous to Example 1B with the product from example 100C (2.38 g, 0.016 mol), sodium thiocyanate (5.14 g, 0.063 mol), sodium bromide (1.63 g, 0.016 mol), and bromine (2.8 g, 0.017 mol) in methanol. 400 MHz <sup>1</sup>H NMR (CDCl<sub>3</sub>) δ 7.30 (m, 2H), 6.81 (d, 1H), 5.49 (brs, 1H), 2.60 (m, 2H), 1.59 (m, 2H), 1.38 (m, 2H), 0.95 (t, 3H).

**Step 5. Preparation of methyl 2-(2-butyl-4-cyanothiophenoxy)acetate (compound 100E)**

**100E**

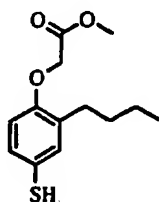
The title compound was prepared in the manner analogous to Example 1C with the product from example 100D (2.80 g, 0.014 mol), methyl bromoacetate (2.28 g, 0.015 mol), and cesium carbonate (6.60 g, 0.020 mol) in 100 ml of acetonitrile. 400 MHz



-212-

$^1\text{H}$  NMR ( $\text{CDCl}_3$ )  $\delta$  7.38 (m, 2H), 6.72 (d, 1H), 4.66 (s, 2H), 3.80 (s, 3H), 2.67 (m, 2H), 1.57 (m, 2H), 1.38 (m, 2H), 0.98 (t, 3H).

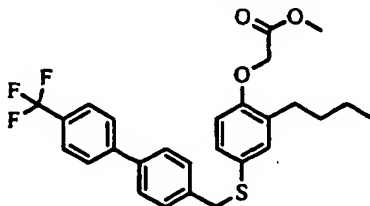
**Step 6. Preparation of methyl 2-(2-butyl-4-sulfanylphenoxy)acetate (compound 100F)**



100 F

The title compound was prepared in the manner analogous to Example 1D with the product from example 100E (2.79 g, 10.0 mmol), dithiothreitol (3.08 g, 20.0 mmol), and 0.2 M potassium dihydrogenphosphate (15 ml) in 60 ml of methanol. 400 MHz  $^1\text{H}$  NMR ( $\text{CDCl}_3$ )  $\delta$  7.11 (m, 2H), 6.60 (d, 1H), 4.61 (s, 2H), 3.81 (s, 3H), 3.36 (s, 1H), 2.63 (m, 2H), 1.57 (m, 2H), 1.38 (m, 2H), 0.98 (t, 3H).

**Step 7. Preparation of methyl 2-[2-butyl-4-((4-(4-(trifluoromethyl)phenyl)phenyl)methylthio)phenoxy]acetate (compound 100G)**



100G

-213-

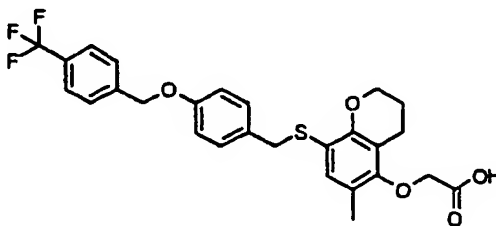
The title compound was prepared in the manner analogous to **Example 1F** using 100F and 1-(bromomethyl)-4-[4-(trifluoromethyl)phenyl]benzene prepared from and phosphorous tribromide and (4'-trifluoromethyl-biphenyl-4-yl)-methanol in a manner analogous to **Example 3B**. 400 MHz  $^1\text{H}$  NMR ( $\text{CDCl}_3$ )  $\delta$  7.68 (m, 4H), 7.51 (d, 2H), 7.29 (d, 2H), 7.15 (m, 2H), 6.60 (d, 1H), 4.62 (s, 2H), 4.04 (s, 2H), 3.79 (s, 3H), 2.60 (m, 2H), 1.55 (m, 2H), 1.35 (m, 2H), 0.88 (t, 3H).

**Step 8. Preparation of 2-[2-butyl-4-({4-[4-(trifluoromethyl)phenyl]phenyl}methylthio)phenoxy]acetic acid (compound 100)**

The title compound was prepared in the manner analogous to **Example 1** with the product from example 100G. mp 155–157 °C; 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.88 (d, 2H), 7.80 (d, 2H), 7.65 (d, 2H), 7.38 (d, 2H), 7.17 (dd, 1H), 7.09 (d, 1H), 6.79 (d, 1H), 4.65 (s, 2H), 4.17 (s, 2H), 2.50 (m, 2H), 1.43 (m, 2H), 1.22 (m, 2H), 0.81 (t, 3H). MS  $m/z$  473 (M-1). Anal. Calc'd for  $\text{C}_{26}\text{H}_{25}\text{O}_3\text{SF}_3$ : C, 65.81; H, 5.31; Found: C, 65.95; H, 5.36.

**Example 101**

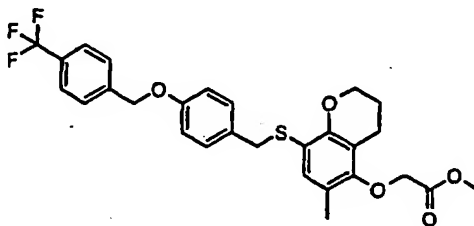
**Preparation of {6-methyl-8-[4-(4-trifluoromethyl-benzyl)oxy]-benzyl-sulfanyl}-chroman-5-yloxy}-acetic acid (compound 101)**



**101**

-214-

**Step 1. {6-methyl-8-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid methyl ester (compound 101A)**

**101A**

5

The title compound was prepared in the manner analogous to **Example 1F** using (8-mercapto-6-methyl-chroman-5-yloxy)-acetic acid methyl ester and the product from **Example 14B**. MS  $m/z$  533 ( $M+1$ ).

10

**Step 2. {6-methyl-8-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-chroman-5-yloxy}-acetic acid (compound 101)**

2N KOH solution (5 ml) was added to a stirred slurry of the product from **Example 101A** (0.4g, 0.75 mmol) in 2-3 ml of methanol, and the mixture was heated briefly on a steambath until nearly clear, then stirred at room temp. After 3 hours the mixture was diluted with 15-20 ml of ice-water and acidified with  $H_3PO_4$ . After 15 minutes the precipitate was filtered off, rinsed 3x with water, and dried to afford the title product, 0.2g, 51%. 400 MHz  $^1H$  NMR ( $DMSO-d_6$ )  $\delta$  7.70 (d, 2H,  $J = 8$  Hz), 7.59 (d, 2H,  $J = 8$  Hz), 7.18 (d, 2H,  $J = 8.5$  Hz), 6.88 (d, 2H,  $J = 8.5$  Hz), 6.83 (s, 1H), 5.14 (s, 2H), 4.21 (s, 2H), 4.06 (t, 2H,  $J = 4.9$ Hz), 3.95 (s, 2H), 2.63 (t, 2H,  $J = 6.3$ Hz), 2.03 (s, 3H), 1.79 (quint, 2H); MS  $m/z$  517 ( $M-1$ ).

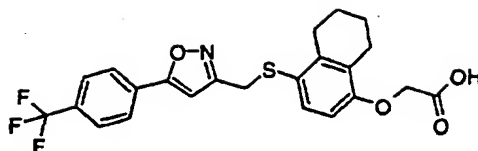
20

### **Example 102**

25

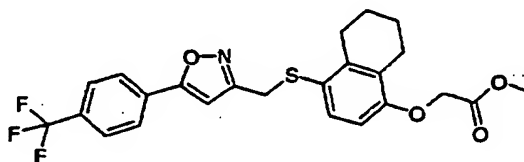
**Preparation of {4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-5,6,7,8-tetrahydro-naphthalen-1-yloxy}-acetic acid (compound 102)**

-215-



102

- 5 **Step 1.** {4-[5-(4-trifluoromethyl)-phenyl]-isoxazol-3-ylmethylsulfanyl}-5,6,7,8-tetrahydro-naphthalen-1-yloxy}-acetic acid methyl ester (compound 102A)



102A

- 10 The title compound was prepared in the manner analogous to Example 1F using (4-mercapto-5,6,7,8-tetrahydro-naphthalen-1-yloxy)-acetic acid methyl ester and the product from Example 42C; recrystallization from methanol afforded the title compound. MS  $m/z$  478 (M+1).

- 15 **Step 2.** {4-[5-(4-trifluoromethyl)-phenyl]-isoxazol-3-ylmethylsulfanyl}-5,6,7,8-tetrahydro-naphthalen-1-yloxy}-acetic acid (compound 102)

- 20 The title compound was prepared in the manner analogous to Example 1 using the product from Example 102A. mp 167-170°C; 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  8.01 (d, 2H,  $J = 8$  Hz), 7.83 (d, 2H,  $J = 8.3$  Hz), 7.14 (d, 2H,  $J = 8.5$  Hz), 7.07 (s, 1H), 6.58 (d, 2H,  $J = 8.8$  Hz), 4.56 (s, 2H), 4.07 (s, 2H), 2.64 (m, 2H), 2.53 (m, 2H), 1.60 (m, 4H); MS  $m/z$  464 (M+1).

- 25 The compounds of the present invention can also be prepared using combinatorial chemistry methods. In particular, compounds of Examples 103-134 were prepared

-216-

using combinatorial chemistry analagous to that previously described in Examples 1-102. The combinatorial chemistry methods useful in the present invention include those where an activated alcohol is contacted with a thiol followed by saponification of the resulting ester to afford the desired products. Such methods can be illustrated by previously described Scheme 1 where compound D is an exemplary thiol, compound Y is an exemplary activated alcohol, and compound F is an exemplary desired product.

## Examples 103-134

Example No.	Name	MS m/z
103	(4-{2-Butyl-5-chloro-1-[4-(1-cyano-cyclopentyl)-benzyl]-1H-imidazol-4-ylmethylsulfanyl}-2-methyl-phenoxy)-acetic acid	552.37
104	[4-(5-Biphenyl-4-yl-2-thiophen-2-yl-4,5-dihydro-oxazol-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid	546.33
105	{4-[2-(4-Bromo-phenoxy)-ethylsulfanyl]-2,6-dimethyl-phenoxy}-acetic acid	451.33
106	[4-(3-{2-[4-(2-Diethylamino-ethoxy)-phenyl]-benzimidazol-1-yl}-propylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid	578.43
107	[4-(5-Biphenyl-4-yl-2-thiophen-2-yl-4,5-dihydro-oxazol-4-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid	516.31
108	(4-{2-[3-(4-Fluoro-phenyl)-benzo[b]thiophen-7-yl]-ethylsulfanyl}-2-methyl-phenoxy)-acetic acid	451.24
109	{2-Methyl-4-[2-(5-phenyl-naphthalen-1-yloxy)-ethylsulfanyl]-phenoxy}-acetic acid	443.3

-217-

110	[2-Methyl-4-(3-phenoxy-benzylsulfanyl)-phenoxy]-acetic acid	379.23
111	[2,5-Dimethyl-4-(5-p-tolyl-1,3,4-oxadiazol-2-ylmethylsulfanyl)-phenoxy]-acetic acid	385.22
112	[2-Methyl-4-(4-pyrazol-1-yl-benzylsulfanyl)-phenoxy]-acetic acid	355.2
113	[2-Methyl-4-(5-methyl-3-phenyl-isoxazol-4-ylmethylsulfanyl)-phenoxy]-acetic acid	370.2
114	[4-(Biphenyl-2-ylmethylsulfanyl)-2-methyl-phenoxy]-acetic acid	363.2
115	{4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid	390.16
116	[2-Methyl-4-(5-p-tolyl-1,3,4-oxadiazol-2-ylmethylsulfanyl)-phenoxy]-acetic acid	371.19
117	{4-[3-(4-Chloro-phenyl)-1,2,4-oxadiazol-5-ylmethylsulfanyl]-2-methyl-phenoxy}-acetic acid	391.14
118	[2,5-Dimethyl-4-(4-pyrazol-1-yl-benzylsulfanyl)-phenoxy]-acetic acid	369.2
119	[4-(Biphenyl-2-ylmethylsulfanyl)-2,5-dimethyl-phenoxy]-acetic acid	377.19
120	[4-(4-Benzoyloxy-benzylsulfanyl)-5,6,7,8-tetrahydronaphthalen-1-yloxy]-acetic acid	433.41
121	[4-(4-Benzoyloxy-benzylsulfanyl)-2,6-dimethyl-phenoxy]-acetic acid	407.39
122	[4-(4-Benzoyloxy-benzylsulfanyl)-2,5-dimethyl-phenoxy]-acetic acid	407.38
123	[4-(4-Benzoyloxy-benzylsulfanyl)-2-methyl-phenoxy]-acetic acid	393.38
124	[4-(4-Benzoyloxy-benzylsulfanyl)-phenoxy]-acetic acid	379.35

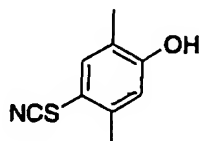
-218-

125	[4-(Biphenyl-4-ylmethylsulfanyl)-5,6,7,8-tetrahydro-naphthalen-1-yloxy]-acetic acid	403.4
126	[4-(Biphenyl-4-ylmethylsulfanyl)-2,6-dimethyl-phenoxy]-acetic acid	377.38
127	[4-(Biphenyl-4-ylmethylsulfanyl)-2,5-dimethyl-phenoxy]-acetic acid	377.37
128	[4-(Biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid	349.32
129	{4-[3-(2-Fluoro-phenoxy)-benzylsulfanyl]-2,6-dimethyl-phenoxy}-acetic acid	411.2
130	[4-(2-{4-[2-(3-Chloro-4-cyclohexyl-phenyl)-ethyl]-piperazin-1-yl}-ethylsulfanyl)-2-methyl-phenoxy]-acetic acid	531.31
131	[5-Methoxy-2-methyl-4-(2-{4-[2-(3-phenyl-benzofuran-7-yl)-ethyl]-piperazin-1-yl}-ethylsulfanyl)-phenoxy]-acetic acid	561.37
132	{4-[2-(2,6-Diphenyl-piperidin-1-yl)-ethylsulfanyl]-5-methoxy-2-methyl-phenoxy}-acetic acid	492.31
133	[2-Methyl-4-(2-{4-[2-(3-phenyl-benzofuran-7-yl)-ethyl]-piperazin-1-yl}-ethylsulfanyl)-phenoxy]-acetic acid	531.32
134	{4-[2-(2,6-Diphenyl-piperidin-1-yl)-ethylsulfanyl]-2-methyl-phenoxy}-acetic acid	462.25

The preparation of Examples 103-134 is further described below.

#### Preparation of Thiols used in Combinatorial Methods

-219-

**Thiol WW****Preparation of 2,5-Dimethyl-4-thiocyanato-phenol (compound WWA)****WWA**

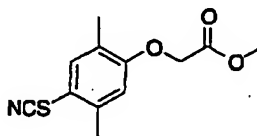
5

The title compound was prepared in a manner analogous to compound 1B.

400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  10.0 (s, 1H), 7.35 (s, 1H), 6.73 (s, 1H), 2.3 (s, 3H), 2.04 (s, 3H); MS  $m/z$  180 ( $m+1$ ).

10

**Preparation of (2,5-Dimethyl-4-thiocyanato-phenoxy)-acetic acid methyl ester (compound WWB)**

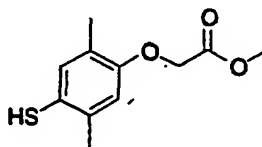
**WWB**

15

The title compound was prepared from compound WWA in a manner analogous to compound 1C. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  7.07 (s, 1H), 6.50 (s, 1H), 4.56 (s, 2H), 3.76 (s, 3H), (s, 1H), 2.26 (s, 3H), 2.17 (s, 3H); MS  $m/z$  252 ( $m+1$ ).

**Preparation of (4-Mercapto-2,5-dimethyl-phenoxy)-acetic acid methyl ester (compound WW)**

20

**WW**



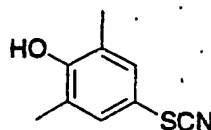
-220-

The title compound was prepared from compound WWB in a manner analogous to compound 1D. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.07 (s, 1H), 6.50 (s, 1H), 4.56 (s, 2H), 3.76 (s, 3H), 3.07 (s, 1H), 2.26 (s, 3H), 2.17 (s, 3H); MS  $m/z$  227 (M+1).

5

### Thiol XX

#### Preparation of 2,6-Dimethyl-4-thiocyanato-phenol (compound XXA)



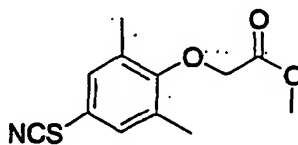
XXA

10

Compound XXA was prepared from 2,6-dimethylphenol in a similar manner as described for compound 1B. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  8.96 (s, 1H), 7.22 (s, 2H), 2.13 (s, 6H).

15

#### Preparation of (2,6-Dimethyl-4-thiocyanato-phenoxy)-acetic acid methyl ester (compound XXB)



XXB

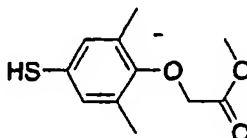
20

Compound XXB was prepared from compound XXA in a similar manner as described for compound 1C to give 2.5 g (46%) of the title compound pure enough for subsequent use. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.11 (s, 2H), 4.41 (s, 2H), 3.63 (s, 3H), 2.14 (s, 6H).

25

-221-

**Preparation of (4-Mercapto-2,6-dimethyl-phenoxy)-acetic acid methyl ester  
(compound XX)**

**XX**

5

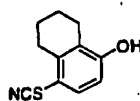
Compound **XX** was prepared from compound **XXB** in a similar manner as described for compound **1D** to give, after purification by flash column chromatography (gradient elution: 100% hexanes to 30% EtOAc/hexanes), 1.8 g (82%) of the title compound. 400 MHz  $^1\text{H}$  NMR ( $\text{DMSO}-d_6$ )  $\delta$  6.90 (s, 2H), 5.51 (s, 1H), 4.39 (s, 2H), 3.66 (s, 3H), 2.10 (s, 6H); MS  $m/z$  225 (M-1).

10

**Thiol YY**

**Preparation of 4-Thiocyanato-5,6,7,8-tetrahydro-naphthalen-1-ol (compound YYA)**

15

**YYA**

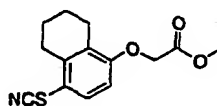
5,6,7,8-Tetrahydro-naphthalen-1-ol (1g, 6.8 mmol) was dissolved in 25 ml acetonitrile. Sodium thiocyanate (1.76 g, 22 mmol) and sodium bromide (0.7 g, 6.8 mmol) were added and stirred for 5 minutes at ambient temperature. Bromine (1.2 g, 7.48 mmol) was added drop wise over 5 minutes. The orange solution was allowed to stir two hours. Brine was added and the crude product was extracted twice into ethyl acetate. The combined organic extracts were washed once with brine, dried over anhydrous sodium sulfate, decanted and concentrated. Normal phase

25

-222-

chromatography afforded the title product, 1.28 g, 92%. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  11.1 (s, 1H), 7.40 (d, 1H,  $J = 8.8$  Hz), 6.61 (d, 1H, 8.8 Hz), 2.78 (m, 2H), 2.59 (m, 2H), 1.70 (m, 4H). MS  $m/z$  278 (m+1)

5      **Preparation of (4-Thiocyanato-5,6,7,8-tetrahydro-naphthalen-1-yloxy)-acetic acid methyl ester (compound YYB)**

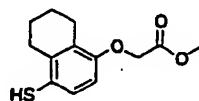
**YYB**

10

The title compound was prepared in the manner analogous to example 1C utilizing compound YYA. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.4 (d, 1H,  $J = 8.8$  Hz), 6.80 (d, 1H, 8.8 Hz), 4.84 (s, 2H), 3.64 (s, 3H), 2.78 (m, 2H), 2.59 (m, 2H), 1.70 (m, 4H). MS  $m/z$  278 (m+1).

15

**Preparation of (4-Mercapto-5,6,7,8-tetrahydro-naphthalen-1-yloxy)-acetic acid methyl ester (compound YY)**

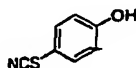
**YY**

20

The title compound was prepared in the manner analogous to example 1D utilizing compound YYB. 400 MHz  $^1\text{H}$  NMR (DMSO- $d_6$ )  $\delta$  7.08 (d, 1H,  $J = 8.8$  Hz), 6.55 (d, 1H, 8.8 Hz), 4.71 (s, 1H), 4.70 (s, 2H), 3.63 (s, 3H), 2.45 (m, 2H), 2.44 (m, 2H), 1.65 (m, 4H). MS  $m/z$  253 (M+1).

25

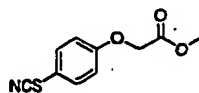
-223-

**Thiol ZZ****Preparation of 4-Thiocyanato-phenol (compound ZZA)****ZZA**

5

The title compound was prepared in the manner analogous to Example 1B using phenol. MS  $m/z$  152 (M+1)

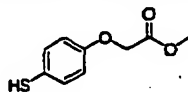
10 **Preparation of [(4-Thiocyanato-phenoxy)-acetic acid methyl ester (compound ZZB)**

**ZZB**

15

The title compound was prepared in the manner analogous to Example 1C using ZZA. MS  $m/z$  224 (M+1)

**Preparation of (4-Mercapto-phenoxy)-acetic acid methyl ester (compound ZZ)**

**ZZ**

20

The title compound was prepared in the manner analogous to Example 1D using ZZB. MS  $m/z$  197 (M-1)

**Preparation of Examples 103-134**

25

**Alcohol Preparation:**

-224-

The appropriate alcohols in the salt form (0.65mmol) were dissolved in 3.0mL of low water MeOH. MP-CO<sub>3</sub> (3.21 mmol/g, 3.70 equivalents to alcohol, 2.41mmol) was then added to each vial containing the alcohol and shaken at ambient temperature for 3h. The samples were then filtered into tared vials and concentrated.

5

**Alcohol Activation:**

Each alcohol sample was then diluted to 0.15M with DCM and 1.0mL of each delivered to a reaction tube. PS-morpholine (4.0 mmol/g, 2 equivalents to alcohol, 0.3mmol) and 25  $\mu$ L methanesulfonyl chloride was then added to each reaction tube. The reaction tubes were shaken at ambient temperature for 16h. The samples were then filtered into collection tubes, the resin rinsed with two 1.0mL aliquots of DCM, and concentrated.

10

**Alkylation:**

Examples 103-134 were synthesized in the following fashion using either the thiol products 2C, 1D, WW, XX, YY or ZZ and the appropriate activated alcohol or alkyl halide. Each thiol was diluted to 0.15M with CH<sub>3</sub>CN and each activated alcohol diluted to 0.15M with CH<sub>3</sub>CN. 1.0mL aliquots of each thiol (0.15 mmol) and 1.0mL aliquots of each activated alcohol (1.0 equivalents, 0.15mmol) were then delivered to a reaction tube and 100mg Cs<sub>2</sub>CO<sub>3</sub> (2 equivalents, 0.3mmol) was added. The reaction tubes were shaken at 60°C for 2.5h. The reaction mixtures were filtered into collection tubes, the resin rinsed with two 1.0mL aliquots of CH<sub>3</sub>CN, and concentrated.

15

20

25

**Saponification:**

Examples 103-134 were synthesized in the following fashion using the products from the alkylation step discussed above. Each alkylation product was diluted with 3.0mL of 0.5M LiOH in 4:1 methoxyethanol:H<sub>2</sub>O, shaken at 60°C for 4h and cooled to ambient temperature. To each reaction, was then added 1.0mL 1N HCl and 1.0mL

-225

brine. Each reaction was extracted twice with 2.0mL EtOAc, and the organic layers concentrated to afford the desired products.

5

## BIOLOGICAL ASSAYS

The compounds of the present invention have demonstrated PPAR modulating activity in the standard assays commonly employed by those skilled in the art.

Accordingly, such compounds and formulations comprising such compounds are  
10 useful for suppressing appetite, modulating leptin, and treating, preventing or  
controlling hypercholesterolemia, dyslipidemia, obesity, eating disorders,  
hyperglycemia, atherosclerosis, hypertriglyceridemia, hyperinsulinemia and diabetes.

### A. Selectivity Measurements

15

#### 1. Test A. Transient transfections assay using the HepG2 hepatoma cell line.

HepG2 cells were transiently transfected with an expression plasmids  
encoding hPPAR $\alpha$ , hPPAR $\beta$  or mPPAR $\gamma$  chimeric receptors and a reporter  
20 containing the yeast upstream activating sequence (UAS) upstream of the viral E1B  
promoter controlling a luciferase reporter gene. In addition, the plasmid pRSV $\beta$ -gal  
was used to control for transfection efficiency. HepG2 cells were grown in DMEM  
supplemented with 10%FBS and 1 $\mu$ M non-essential amino acid. On the first day,  
cells were split into 100mm dishes at 2.5x10<sup>6</sup>/dish and incubated overnight at  
25 37C°/5% CO<sub>2</sub>. On the second day the cells were transiently transfected with plasmid  
DNA encoding a chimeric receptor, the luciferase reporter gene; and  $\beta$ -gal. For each  
100 mm dish, 15 $\mu$ g of luciferase reporter (PG5E1b) DNA, 15 $\mu$ g of Gal4-PPAR  
chimeric receptor DNA, and 1.5 $\mu$ g of  $\beta$ -gal plasmid DNA were mixed with 1.4ml of  
opti-MEM in the tube. 28 $\mu$ l of Lipofectamine-2000 reagent was added to 1.4ml of  
30 opti-MEM in the tube, and incubate for 5 min. at RT. The diluted Lipofectamine-2000

-226-

reagent was combined with the DNA mixture, and incubate for 20 min at RT. After fresh medium was added to each 100mm dish of cells, 2.8ml of Lipofectamine2000-DNA mixture was added dropwise to the 100mm dish containing 14ml of medium, and incubate 37°C overnight. On day three cells were trypsinized off the 100 mm dishes and re-plated on 96 well plates. Cells were plated at  $2.5 \times 10^4$  cells per well in 150µl of media and 50µl of compound diluted by media was added. The test compound added were in the range from 50µM to 50pM. After addition of compounds, the plates were incubated at 37°C for 24 hours. Subsequently cells were washed with once with 100µl of PBS, lysed, and processed for measuring luciferase and β-gal activity using Dual-Light luciferase kit from Tropix®, according to the manufacturer's recommendations, on an EG&G Bethold MicroLumat LB96P luminometer. EC<sub>50</sub> values were obtained using the GraphPad Prism™ program. Surprisingly, the compounds of the present invention exhibit activity for both PPARα and PPARβ. Compounds of the present invention exhibited a range of Hep G2-hBeta EC<sub>50</sub>'s ("EC<sub>50β</sub>") and Hep G2-hAlpha EC<sub>50</sub>'s ("EC<sub>50α</sub>") from greater than zero to about 20µM. Specifically, as shown in Table 1, the Hep G2-hBeta EC<sub>50</sub>'s and Hep G2-hAlpha EC<sub>50</sub>'s for the compounds of the present invention fall within the following 6 groups:

- I) >0-300 nM
- II) >300-500 nM
- III) >500-1000 nM
- IV) >1000-2000 nM
- V) >2000-5000 nM
- VI) >5000 nM

-227-

Table 1

Compound	EC <sub>50</sub> $\beta$ nM (Group)	EC <sub>50</sub> $\alpha$ nM (Group)
1	I	I
3	I	V
4	I	I
5	IV	-
7	I	I
9	I	I
10	I	II
11	I	III
12	I	-
14	I	I
15	I	-
16	I	I
17	IV	V
18	I	VI
19	I	I
20	I	V
21	I	I
22	IV	III
23	I	I
25	V	IV
26	I	-
27	V	III
28	IV	IV



-228-

29	I	I
30	IV	IV
31	VI	IV
32	II	IV
33	IV	IV
34	I	I
35	II	I
36	V	I
37	I	-
38	I	-
39	I	-
40	III	-
41	I	V
42	I	V
43	I	III
44	III	VI
45	I	-
46	I	I
47	VI	-
48	I	V
49	I	II
50	V	-
51	V	-
52	I	III
53	I	IV
54	II	-
57	V	IV
58	V	-

-229-

59	IV	VI
60	VI	-
61	II	-
62	IV	VI
63	I	V
64	VI	-
65	VI	-
66	VI	-
67	I	-
68	IV	-
69	V	-
70	III	-
71	III	-
72	IV	-
73	I	V
74	I	V
75	III	-
76	IV	-
77	II	-
78	II	-
79	II	VI
80	IV	-
81	I	VI
84	II	VI
85	IV	-
87	V	-
88	VI	-
89	IV	-

-230-

90	III	-
91	V	-
92	I	I
93	III	-
97	III	VI
98	V	-
99	II	-
100	III	-

**B. Effect of PPAR modulators on lipid and human apoprotein A1 concentrations in the hApoA1 transgenic mouse**

5

Mice, transgenic for human apoA1, were purchased from Jackson laboratories. All animals were allowed normal chow (Ralston-Purina) and water ad libitum in temperature controlled rooms, under a 12-h light, 12-h dark cycle beginning with lights on at 6 AM. During the treatment phase of the study the mice were dosed daily between 6 and 9 AM by oral gavage using a suspension vehicle of 1.5% carboxymethylcellulose plus 0.2 percent Tween-20 (CMC/Tween) containing the specified compounds. Control animals received vehicle alone. Vehicle volume represented 0.25 percent of body weight. Under anesthesia, tail blood was obtained weekly in the morning at the indicated days of study. At termination, tissue samples (liver, intestine, fat, and muscle) were taken to study effects on genes effecting lipid metabolism. Each of the compounds of the present invention that were tested effected a significant increase in HDL over the values observed for the control animals. Furthermore, these compounds resulted in triglyceride levels which were lower than observed in controls. Compounds of the present invention tested in the hApoAI transgenic mouse model showed a range of HDL-c elevation and triglyceride lowering when dosed at 30 mg/kg/day. For instance, Example 4 raised HDL-c 97% and lowered triglycerides 65 % relative to the control population,

10

15

20

-231-

Example 6 raised HDL-c 24% and lowered triglycerides 59 % relative to the control population, and Example 3 raised HDL-c 9% and lowered triglycerides 70% relative to the control population.

### 5 C. Effect of Compounds of the Invention on Insulin Resistant or Diabetic Cynomolgus Monkeys

Cynomolgus monkeys that were either insulin resistant or diabetic (type II) were treated for eight weeks with [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid in a rising dose fashion (0.1 to 1  
10 mg/kg). Plasma was sampled bi-weekly and analyzed for glycemics and leptin. Body weight was also measured at various time points across the study. The diabetic monkey mean body weight data is presented in Table 2 and the insulin resistant monkey mean body weight data is presented in Table 3.

15

**Table 2**  
**Diabetic Monkey Mean Body Weight**

	-7wk	-4wk	Mean Baseline	2wk	5wk	7wk	8wk
Diab Ctl Mean	8.10	8.05	8.08	8.17	8.18	8.17	8.19
Diab Ctl StDev	3.77	3.77	3.77	3.74	3.70	3.70	3.64
Diab Ctl SEM	1.89	1.88	1.89	1.87	1.85	1.85	1.82
Diab Txt Mean	8.84	8.91	8.87	8.75	8.37	8.08	7.80
Diab Txt StDev	3.73	3.68	3.70	3.61	3.52	3.34	3.20
Diab Txt SEM	1.32	1.30	1.31	1.28	1.24	1.18	1.13

20 IR = insulin resistant, Diab = diabetic, Ctl = control, Txt = experimental, StDev = standard deviation, SEM = standard error of the mean

-232-

**Table 3**  
**Insulin Resistant Monkey Mean Body Weight**

	-7wk	-4wk	Mean Baseline	2wk	4wk	6wk	8wk
IR Ctl Mean	6.18	6.15	6.17	6.04	6.00	5.94	5.91
IR Ctl StDev	3.48	3.43	3.46	3.22	3.19	3.16	3.17
IR Ctl SEM	1.74	1.72	1.73	1.61	1.60	1.58	1.59
IR Txt Mean	5.25	5.32	5.29	5.26	5.04	4.91	4.71
IR Txt StDev	3.17	3.22	3.19	3.42	3.40	3.34	3.20
IR Txt SEM	0.95	0.97	0.96	1.03	1.03	1.01	0.96

IR = insulin resistant, Diab = diabetic, Ctl = control, Txt = treated, StDev = standard deviation, SEM = standard error of the mean

Plasma leptin values, presented as baseline values vs. 8-week treatment, were determined by ELISA and are presented in Table 4. The effect of [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid on plasma leptin values in diabetic and insulin resistant obese cynomolgus monkeys is demonstrated by the lesser increase in plasma leptin values seen in the treated animals.

The amount of exogenous insulin the diabetic monkeys received to maintain proper glucose levels, the exogenous insulin requirement, is also presented in Table 4 as baseline values vs. 8-week treatment. By definition, insulin resistant monkeys are not yet diabetic and do not receive exogenous insulin. A reduction in exogenous insulin requirements is a measure of improved insulin sensitivity and glucose control.

-233-

**Table 4**  
**Leptin and Exogenous Insulin**

	Pre-Treatment	Post-Treatment
<b>Exogenous Insulin Requirement (u/day)</b>		
Diabetic Controls	89 ± 71	101 ± 73
Diabetic Treated	66 ± 16	18 ± 4
<b>Leptin (ng/ml)</b>		
Diabetic Controls	6.55 ± 1.38	18.83 ± 0.24
Diabetic Treated	7.22 ± 0.93	10.89 ± 2.7
Insulin Resistant Controls	9.85 ± 0.45	13.60 ± 3.45
Insulin Resistant Treated	7.33 ± 1.16	5.73 ± 2.14

5

## FORMULATIONS

10 The compounds of the present invention can be administered alone or in combination with one or more therapeutic agents. These include, for example, other agents for the treatment, control, or prevention of hypercholesteremia, dyslipidemia, obesity, hyperglycemia, hypercholesteremia, atherosclerosis, hypertriglyceridemia, and hyperinsulinemia. The compounds of the present invention can be administered  
15 alone or in combination with one or more therapeutic agents for the suppression of appetite and modulation of leptin.

The compounds are thus well suited to formulation for convenient administration to mammals for the prevention and treatment of such disorders.

20 The following examples further illustrate typical formulations provided by the invention.

-234-

**Formulation 1**

Ingredient	Amount
compound of Formulas I-V	0.5 to 800 mg
sodium benzoate	5 mg
isotonic saline	1000 mL

The above ingredients are mixed and dissolved in the saline for IV administration to a patient.

5

**Formulation 2**

Ingredient	Amount
compound of Formulas I-V	0.5 to 800 mg
cellulose, microcrystalline	400 mg
stearic acid	5 mg
silicon dioxide	10 mg
sugar, confectionery	50 mg

The ingredients are blended to uniformity and pressed into a tablet that is well suited for oral administration to a patient.

10

**Formulation 3**

Ingredient	Amount
compound of Formulas I-V	0.5 to 800 mg
starch, dried	250 mg
magnesium stearate	10 mg

The ingredients are combined and milled to afford material suitable for filling hard gelatin capsules administered to a patient.

15

**Formulation 4**

Ingredient	Amount	% wt./ (total wt.)
compound of Formulas I-V	1 to 50	
Polyethylene glycol 1000	32 to 75	
Polyethylene glycol 4000	16 to 25	

-235-

The ingredients are combined via melting and then poured into molds containing  
2.5 g total weight.

5           While embodiments of the invention have been illustrated and described, it is  
not intended that these embodiments illustrate and describe all possible forms of the  
invention. Rather, the words used in the specification are words of description rather  
than limitation; and it is understood that various changes may be made without  
departing from the spirit and scope of the invention.

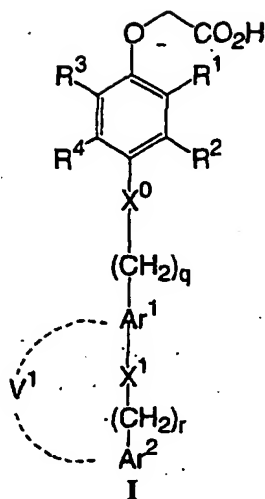
10



-236-

What is claimed is:

1. A compound of formula (I):



and pharmaceutically acceptable salts thereof, wherein:

$X^0$  and  $X^1$  are independently absent, O, S,  $-\text{CH}_2-$ ,  $-\text{CH}_2\text{CH}_2-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{CH}\equiv\text{CH}-$ ,  $-\text{S}(\text{O})_2-$ , or  $-\text{S}(\text{O})-$ ;

$\text{Ar}^1$  and  $\text{Ar}^2$  are each independently unsubstituted or substituted aryl or heteroaryl, provided that  $\text{Ar}^1$  is not thiazolyl or oxazolyl;

$V^1$  is absent; or when present,  $V^1$  is a saturated or unsaturated hydrocarbon chain which is substituted or unsubstituted, wherein said chain has from

1 to 4 atoms so that  $V^1$ ,  $\text{Ar}^1$ ,  $X^1$ ,  $(\text{CH}_2)_r$  and  $\text{Ar}^2$ , together form a five to eight membered ring;

$R^1$  and  $R^2$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $\text{O}-(\text{CH}_2)_m\text{CF}_3$ , halogen, nitro, cyano,  $-\text{OH}$ ,  $-\text{SH}$ ,  $-\text{CF}_3$ ,  $-\text{S}(\text{O})_p\text{alkyl}$ ,  $\text{S}(\text{O})_p\text{aryl}$ ,  $-(\text{CH}_2)_m\text{OR}^5$ ,  $-(\text{CH}_2)_m\text{NR}^6\text{R}^7$ ,  $-\text{COR}^5$ ,  $-\text{CO}_2\text{R}^5$ , or  $-\text{NR}^6\text{R}^7$ , or together with the atoms to which they are attached form a five to eight member ring;

$R^3$  and  $R^4$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $\text{O}-(\text{CH}_2)_m\text{CF}_3$ , halogen, nitro, cyano,  $-\text{OH}$ ,  $-\text{SH}$ ,  $-\text{CF}_3$ ,  $-\text{S}(\text{O})_p\text{alkyl}$ ,  $\text{S}(\text{O})_p\text{aryl}$ ,  $-(\text{CH}_2)_m\text{OR}^5$ ,  $-(\text{CH}_2)_m\text{NR}^6\text{R}^7$ ,  $-\text{COR}^5$ ,  $-\text{CO}_2\text{H}$ ,  $-\text{CO}_2\text{R}^5$ , or  $-\text{NR}^6\text{R}^7$ ;

-237-

provided that at least one of  $R_1$ - $R_4$  is H, lower alkyl, lower alkoxy, haloalkyl,  $O-(CH_2)_mCF_3$ , halogen, nitro, cyano,  $-OH$ ,  $-SH$ ,  $-CF_3$ ,  $-S(O)_palkyl$ ,  $S(O)_paryl$ ,  $-(CH_2)_mOR^5$ ,  $-(CH_2)_mNR^6R^7$ , or  $NR^6R^7$ ;

$R^5$  is hydrogen, alkyl, alkenyl, alkynyl, or aryl;

$R^6$  and  $R^7$  are each independently hydrogen, alkyl, alkenyl, alkynyl,  $-COalkyl$ ,  $-COaryl$ , cycloalkyl,  $-CO_2alkyl$ ,  $-CO_2aryl$ , or  $R^6$  and  $R^7$  together with the atoms to which they are attached form a 4 to 7 membered ring having 1 to 3 heteroatoms;

$m$  is 0 to 5;

$p$  is 0, 1, or 2;

$q$  is 0 to 6; and

$r$  is 0 to 6.

2. The compound of claim 1, wherein

$X^0$  is S;

$X^1$  is absent;

$Ar^1$  and  $Ar^2$  are each independently unsubstituted or substituted aryl;

$V^1$

is absent;

$R^1$  is hydrogen;

$R^2$  is lower alkyl, lower alkoxy, haloalkyl,  $O-(CH_2)_mCF_3$ , halogen, nitro, cyano,  $-OH$ ,  $-SH$ ,  $-CF_3$ ,  $-S(O)_palkyl$ ,  $S(O)_paryl$ ,  $-(CH_2)_mOR^5$ ,  $-(CH_2)_mNR^6R^7$ ,  $-COR^5$ ,  $-CO_2R^5$ , or  $-NR^6R^7$ ;

$R^3$  is lower alkyl, lower alkoxy, haloalkyl,  $O-(CH_2)_mCF_3$ , halogen, nitro, cyano,  $-OH$ ,  $-SH$ ,  $-CF_3$ ,  $-S(O)_palkyl$ ,  $S(O)_paryl$ ,  $-(CH_2)_mOR^5$ ,  $-(CH_2)_mNR^6R^7$ ,  $-COR^5$ ,  $-CO_2H$ ,  $-CO_2R^5$ , or  $-NR^6R^7$ ;

$R^4$  is hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $O-(CH_2)_mCF_3$ , halogen, nitro, cyano,  $-OH$ ,  $-SH$ ,  $-CF_3$ ,  $-S(O)_palkyl$ ,  $S(O)_paryl$ ,  $-(CH_2)_mOR^5$ ,  $-(CH_2)_mNR^6R^7$ ,  $-COR^5$ ,  $-CO_2H$ ,  $-CO_2R^5$ , or  $-NR^6R^7$ ;

$R^5$  is hydrogen, alkyl, alkenyl, alkynyl, or aryl;

$R^6$  and  $R^7$  are each independently hydrogen, alkyl, alkenyl, alkynyl,  $-COalkyl$ ,  $-COaryl$ , cycloalkyl,  $-CO_2alkyl$ ,  $-CO_2aryl$ , or  $R^6$  and  $R^7$  together with the atoms to which they are attached form a 4 to 7 membered ring having 1 to 3 heteroatoms;

$m$  is 0 to 5;

$p$  is 0, 1, or 2;

$q$  is 1; and

$r$  is 0.

3. The compound of claim 1; wherein

$X^0$  is S;

$X^1$  is absent;

-238-

Ar<sup>1</sup> is phenyl;  
Ar<sup>2</sup> is substituted phenyl;

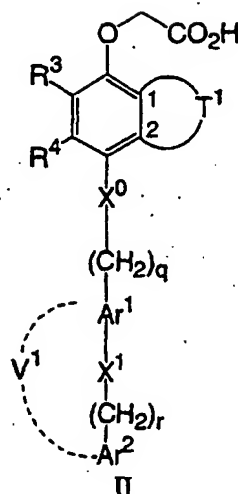
V<sup>1</sup>

is absent;

R<sup>1</sup> is hydrogen;  
R<sup>2</sup> is lower alkoxy;  
R<sup>3</sup> is lower alkyl;  
R<sup>4</sup> is hydrogen;  
q is 1; and  
r is 0.

10

4. A compound having Formula II:





15


and pharmaceutically acceptable salts thereof, wherein:

X<sup>0</sup> and X<sup>1</sup> are independently absent, O, S, -CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-, -CH=CH-, -CH≡CH-, -S(O)<sub>2</sub>-, or -S(O)-;

Ar<sup>1</sup> and Ar<sup>2</sup> are each independently unsubstituted or substituted aryl or heteroaryl, provided that Ar<sup>1</sup> is not thiazolyl or oxazolyl;

-239-


 is absent; or when present,  is a saturated or unsaturated hydrocarbon chain which is substituted or unsubstituted, wherein said chain has from

1 to 4 atoms so that , Ar<sup>1</sup>, X<sup>1</sup>, (CH<sub>2</sub>)<sub>r</sub>, and Ar<sup>2</sup>, together form a four to eight member ring;

5 R<sup>3</sup> and R<sup>4</sup> are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl, -O-(CH<sub>2</sub>)<sub>m</sub>CF<sub>3</sub>, halogen, nitro, cyano, -OH, -SH, -CF<sub>3</sub>, -S(O)<sub>p</sub>alkyl, S(O)<sub>p</sub>aryl, -(CH<sub>2</sub>)<sub>m</sub>OR<sup>5</sup>, -(CH<sub>2</sub>)<sub>m</sub>NR<sup>6</sup>R<sup>7</sup>, -COR<sup>5</sup>, -CO<sub>2</sub>H, -CO<sub>2</sub>R<sup>5</sup>, or -NR<sup>6</sup>R<sup>7</sup>;


R<sup>5</sup> is hydrogen, alkyl, alkenyl, alkynyl, or aryl;

10 R<sup>6</sup> and R<sup>7</sup> are each independently hydrogen, alkyl, alkenyl, alkynyl, -COalkyl, -COaryl, cycloalkyl, -CO<sub>2</sub>alkyl, -CO<sub>2</sub>aryl, -SO<sub>2</sub>alkyl, -SO<sub>2</sub>aryl, or R<sup>6</sup> and R<sup>7</sup> together with the atoms to which they are attached form a 4 to 7 membered ring having 1 to 3 heteroatoms;

 is a saturated or unsaturated, substituted or unsubstituted hydrocarbon chain or hydrocarbon-heteroatom chain having from 3 to 6 atoms wherein the carbon atom of position 2 is connected to the carbon atom of position 3 to form a five to

15 eight member ring;  
m is 0 to 5;  
p is 0 to 2;  
q is 0 to 6; and  
20 r is 0 to 6.

5. The compound of claim 18; wherein  
X<sup>0</sup> is S;  
25 X<sup>1</sup> is O;  
Ar<sup>1</sup> is phenyl;  
Ar<sup>2</sup> is 4-trifluoromethylphenyl;

 is absent;

30 R<sup>3</sup> is hydrogen, lower alkyl, lower alkoxy;  
R<sup>4</sup> is hydrogen, lower alkyl, lower alkoxy;  
m is 0 to 5;

p is 0, 1, or 2;

q is 1;

r is 1; and

5  $\tau^1$  is  $-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{O}-\text{CH}_2-$ ,  $-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_2-$ ,  
 $-\text{CH}_2-\text{HC}=\text{CH}-\text{CH}_2-$ ,  $-\text{CH}_2-\text{HC}=\text{CH}-$ ,  $-\text{CH}_2\text{CH}_2-\text{N R}^4-\text{CH}_2-$ ,  $-\text{COCH}=\text{CH}-\text{O}-$ ,  $-\text{O}-$   
 $\text{CH}=\text{CH}-\text{CO}-$ ,  $-\text{CH}=\text{CH}-\text{NR}^4-$ ,  $-\text{NR}^4-\text{CH}=\text{CH}-$ ,  $-\text{CH}=\text{CH}-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{NR}^4-$ ,  
 $-\text{NR}^4-\text{CH}_2-\text{CH}_2-$ ,  $-\text{O}-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{O}-$ ,  $-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NR}^4-$ ,  $-\text{NR}^4-\text{CH}_2-\text{CH}_2-$   
 $\text{CH}_2-$ ,  $-\text{O}-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{O}-$ .

10 6. The compound of claim 18, wherein  $\tau^1$  is  $-\text{CH}_2\text{CH}_2\text{CO}-\text{O}-$ ,  $-\text{CH}_2-\text{CH}_2-\text{O}-$ ,  
 $\text{CO}-$ ,  $-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{HC}=\text{CH}-\text{HC}=\text{CH}-$ ,  $-\text{N}=\text{CH}-\text{HC}=\text{CH}-$ ,  $-\text{HC}=\text{N}-$   
 $\text{HC}=\text{CH}-$ ,  $-\text{HC}=\text{CH}-\text{N}=\text{CH}-$ ,  $-\text{HC}=\text{CH}-\text{HC}=\text{N}-$ ,  $-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-$   
 $\text{O}-\text{CH}_2-$ ,  $-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{HC}=\text{CH}-\text{CH}_2-$ ,  $-\text{CH}_2-\text{HC}=\text{CH}-$ ,  $-\text{CH}_2\text{CH}_2-$   
 $\text{N R}^4-\text{CH}_2-$ ,  $-\text{COCH}=\text{CH}-\text{O}-$ ,  $-\text{O}-\text{CH}=\text{CH}-\text{CO}-$ ,  $-\text{CH}=\text{CH}-\text{NR}^4-$ ,  $-\text{NR}^4-$   
 $\text{CH}=\text{CH}-$ ,  $-\text{CH}=\text{CH}-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{NR}^4-$ ,  $-\text{NR}^4-\text{CH}_2-\text{CH}_2-$ ,  $-\text{O}-\text{CH}_2-\text{CH}_2-$ ,  
 $\text{CH}_2-\text{CH}_2-\text{O}-$ ,  $-\text{CH}_2-\text{CH}_2-\text{CO}-$ ,  $-\text{CH}_2-\text{CO}-\text{CH}_2-$ ,  $-\text{CO}-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-$   
 $\text{CH}_2-\text{CO}-$ ,  $-\text{CO}-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CO}-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{CO}-\text{CH}_2-$ ,  
 $-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NR}^4-$ ,  $-\text{NR}^4-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{O}-\text{CH}_2-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-$   
 $\text{CH}_2-\text{O}-$ ,  $-\text{CO}-\text{NR}^4-\text{CH}_2-\text{CH}_2-$ ,  $\text{NR}^4\text{CO}-\text{CH}_2-\text{CH}_2-$ ,  $-\text{CH}_2-\text{CH}_2-\text{NR}^4-\text{CO}-$ , or  $-\text{CH}_2-\text{CH}_2-\text{CO}-\text{NR}^4-$ .

20 7. A compound selected from:  
 [4-(Biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-acetic acid;  
 [5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-  
 25 phenoxy]-acetic acid;  
 [4-(2',4'-Dichloro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-  
 phenoxy]-acetic acid;  
 [5-Methoxy-2-methyl-4-(3'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-  
 phenoxy]-acetic acid;  
 30 [4-(4'-Fluoro-biphenyl-4-ylmethylsulfanyl)-5-methoxy-2-methyl-phenoxy]-  
 acetic acid;  
 [7-(4'-Trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-indan-4-yloxy]-acetic  
 acid;

-241-

{5-Methoxy-2-methyl-4-[4-(4-trifluoromethyl-benzyloxy)-benzylsulfanyl]-phenoxy}-acetic acid;

[5-Methoxy-2-methyl-4-(3'-trifluoromethoxy-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid;

5 { [5-Methoxy-2-methyl-4-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-phenoxy]-acetic acid;

{5-Methoxy-2-methyl-4-[6-(4-trifluoromethyl-phenyl)-pyridin-3-ylmethylsulfanyl]-phenoxy}-acetic acid;

10 [3-Methoxy-4-(4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

{5-Methoxy-2-methyl-4-[2-(4'-trifluoromethyl-biphenyl-4-yl)-ethylsulfanyl]-phenoxy}-acetic acid;

(4-[4-[2-(3-Fluoro-phenyl)-vinyl]-benzylsulfanyl]-5-methoxy-2-methyl-phenoxy)-acetic acid;

15 [5-Methoxy-2-methyl-4-(3-methyl-4'-trifluoromethyl-biphenyl-4-ylmethylsulfanyl)-phenoxy]-acetic acid;

{4-[5-(4-Chloro-phenyl)-isoxazol-3-ylmethylsulfanyl]-5-methoxy-2-methyl-phenoxy}-acetic acid;

20 [5-Methoxy-2-methyl-4-[5-(4-trifluoromethyl-phenyl)-isoxazol-3-ylmethylsulfanyl]-phenoxy]-acetic acid;

[5-Methoxy-2-methyl-4-[3-(4-trifluoromethyl-phenyl)-isoxazol-5-ylmethylsulfanyl]-phenoxy]-acetic acid;

[5-Methoxy-2-methyl-4-(4'-trifluoromethyl-biphenyl-3-ylmethylsulfanyl)-phenoxy]-acetic acid;

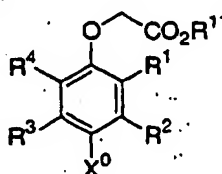
25 [7-[4-(4-Trifluoromethyl-benzyloxy)-benzylsulfanyl]-indan-4-yloxy]-acetic acid;

{5-Methyl-7-[4-(5-trifluoromethyl-pyridin-2-yl)-benzylsulfanyl]-2,3-dihydro-benzofuran-4-yloxy}-acetic acid;

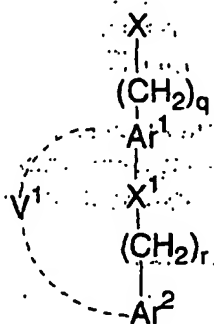
and pharmaceutically acceptable salts thereof.

-242-

8. A pharmaceutical composition comprising a compound of Claim 1 admixed with a carrier, diluent, or excipient.
- 5 9. A method of treating, preventing or controlling non-insulin dependent diabetes mellitus in a mammal comprising administering to the mammal in need thereof a therapeutically effective amount of a compound of Claim 1.
- 10 10. A method of treating, preventing or controlling obesity in a mammal comprising administering to the mammal in need thereof a therapeutically effective amount of a compound of Claim 1.
11. A method of modulating leptin levels in a mammal comprising administering to the mammal in need thereof a therapeutically effective amount of a compound of Claim 1.
- 15 12. A method of treating, preventing or controlling dyslipidemia in a mammal comprising administering to the mammal in need thereof a therapeutically effective amount of a compound of Claim 1.
- 20 13. A method of treating, preventing or controlling hypercholesteremia in a mammal comprising administering to the mammal in need thereof a therapeutically effective amount of a compound of Claim 1.
- 25 14. A method of making a compound of claim 1 or a pharmaceutically acceptable salt thereof; comprising, reacting:



with:



30

wherein:

-243-

$X^0$  is OH or SH;

$X^1$  is absent, O, or S;

$Ar^1$  and  $Ar^2$  are each independently a unsubstituted or substituted aryl or heteroaryl;

5  $V^1$  is absent or a saturated or unsaturated, substituted or unsubstituted hydrocarbon chain or hydrocarbon-heteroatom chain having from 0 to 3 atoms wherein a four to eight member ring is formed fused to  $Ar^1$  and

10  $Ar^2$  wherein if  $V^1$  is absent and either "—" is a bond then  $Ar^1$  is directly bonded to  $Ar^2$ ;  
 $R^1$  and  $R^2$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $O-(CH_2)_pCF_3$ , halogen, nitro, cyano, -OH, -SH, -CF<sub>3</sub>, -S(O)<sub>p</sub>alkyl, S(O)<sub>p</sub>aryl,  $-(CH_2)_mOR^8$ ,  $-(CH_2)_mNR^9R^{10}$ , -COR<sup>8</sup>, -CO<sub>2</sub>H, -CO<sub>2</sub>R<sup>8</sup>, or -NR<sup>9</sup>R<sup>10</sup>, or joined together to form a five to eight member ring;  
 15  $R^3$  and  $R^4$  are selected from hydrogen, lower alkyl, lower alkoxy, haloalkyl,  $O-(CH_2)_pCF_3$ , halogen, nitro, cyano, -OH, -SH, -CF<sub>3</sub>, -S(O)<sub>p</sub>alkyl, S(O)<sub>p</sub>aryl,  $-(CH_2)_mOR^8$ ,  $-(CH_2)_mNR^9R^{10}$ , -COR<sup>8</sup>, -CO<sub>2</sub>H, -CO<sub>2</sub>R<sup>8</sup>, or -NR<sup>9</sup>R<sup>10</sup>;

$R^5$  and  $R^6$  are independently hydrogen, alkyl, alkenyl, alkynyl, or aryl, or joined together to form a 3 to 7 member cycloalkyl or cycloalkenyl;  
 20  $R^7$  and  $R^8$  are independently hydrogen, alkyl, alkenyl, alkynyl, or aryl;  
 $R^9$  and  $R^{10}$  are each independently hydrogen, alkyl, alkenyl, alkynyl, -COalkyl, -COaryl, cycloalkyl, -CO<sub>2</sub>alkyl, -CO<sub>2</sub>aryl, -SO<sub>2</sub>alkyl, -SO<sub>2</sub>aryl, or joined together to form a 4 to 7 member ring having 1 to 3 heteroatoms;

25  $R^{11}$  is a lower alkyl;

X is a halogen;

m is 0 to 5;

p is 0 to 2;

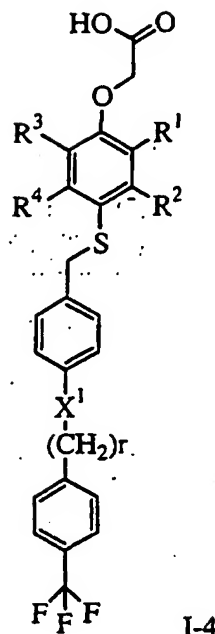
q is 0 to 6; and

30 r is 0 to 6.

15. A process for preparing the compound of formula I-4 which is:

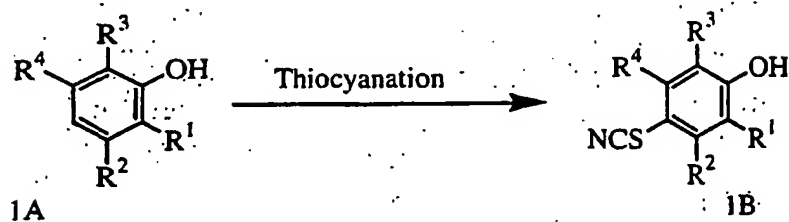


-244-

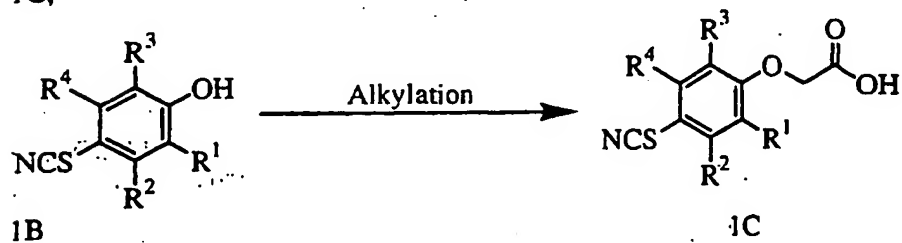


comprising:

(a) conversion of phenol 1A to the thiocyanate 1B;

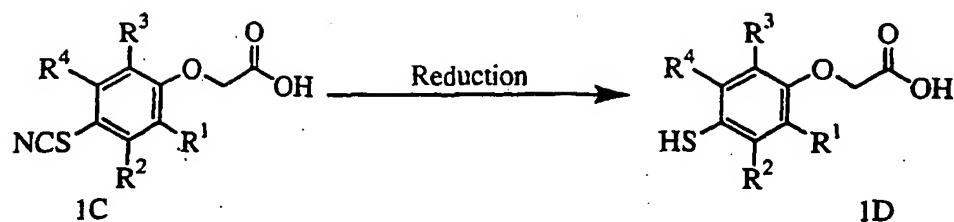


(b) alkylation of phenol moiety of thiocyanate 1B to acetoxyester 1C;



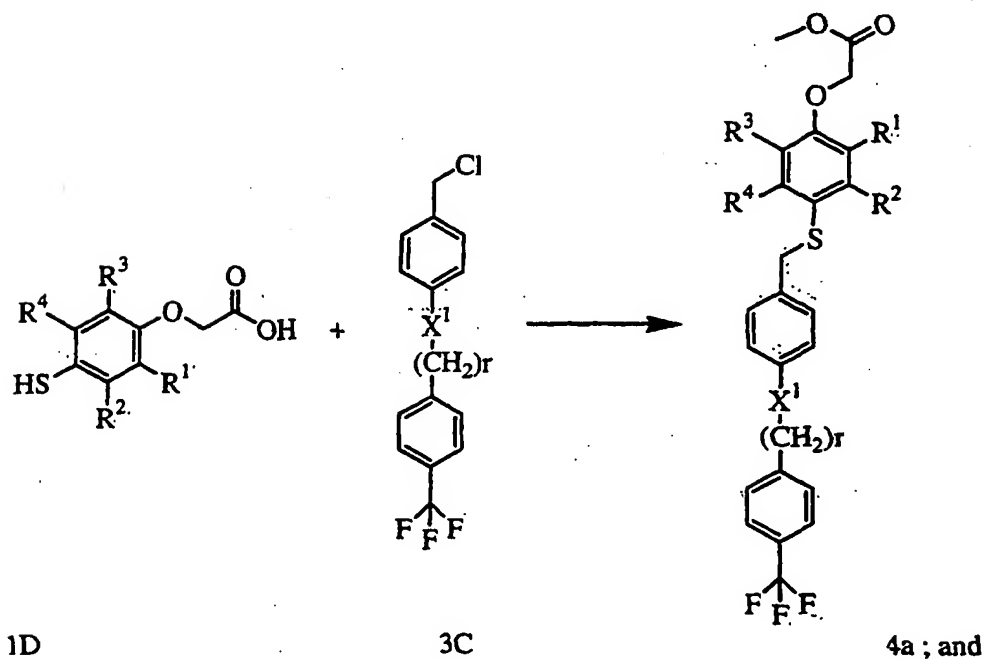
(c) reduction of the thiocyanate moiety in 1C to form thiol 1D;

-245-



(d) alkylation of thiol 1D with chloride 3C to form 4a;

5



(e) saponification of the ester moiety in 4a to form I-4;

10

wherein

$R^1$  is hydrogen or together with  $R^2$  forms a 5 membered carbocyclic ring;

$R^2$  is methoxy or together with  $R^1$  forms a 5 membered carbocyclic ring;

$R^3$  is hydrogen or methyl;

$R^4$  is hydrogen;

15

$X^1$  is absent or O; and

$r$  is 0 or 1.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
16 October 2003 (16.10.2003)

PCT

(10) International Publication Number  
**WO 03/084916 A3**

(51) International Patent Classification<sup>7</sup>: **C07C 59/70**,  
317/22, 323/19, C07D 209/10, 213/20, 213/32, 261/08,  
311/58, 405/12, 413/12, A61K 31/19, A61P 3/06, 9/10

[US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US).

(21) International Application Number: PCT/IB03/01121

(74) Agent: **LUMB, J., Trevor**; Pfizer Inc., 201 Tabor Road, Morris Plains, NJ 07950 (US).

(22) International Filing Date: 24 March 2003 (24.03.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/370,508 5 April 2002 (05.04.2002) US  
60/386,026 5 June 2002 (05.06.2002) US

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(71) Applicant (*for all designated States except US*): **WARNER-LAMBERT COMPANY LLC** [US/US]; 201 Tabor Road, Morris Plains, NJ 07950 (US).

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **FILZEN, Gary, Frederick** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **TRIVEDI, Bharat, Kalidas** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **GEYER, Andrew, George** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **UNANGST, Paul, Charles** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **BRATTON, Larry, Don** [US/US]; Pfizer Global Research and Development, Ann Arbor Laboratories, 2800 Plymouth Road, Ann Arbor, MI 48105 (US). **AUERBACH, Bruce, Jeffrey**

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:  
24 December 2003

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: COMPOUNDS THAT MODULATE PPAR ACTIVITY AND METHODS FOR THEIR PREPARATION

(57) Abstract: This invention discloses compounds that alter PPAR activity. The invention also discloses pharmaceutically acceptable salts of the compounds, pharmaceutically acceptable compositions comprising the compounds or their salts, and methods of using them as therapeutic agents for treating or preventing hyperlipidemia, hypercholesterolemia, obesity, eating disorders, hyperglycemia, atherosclerosis, hypertriglyceridemia, hyperinsulinemia and diabetes in a mammal as well as methods of suppressing appetite and modulating leptin levels in a mammal. The present invention also discloses methods for making the disclosed compounds.

WO 03/084916 A3

# INTERNATIONAL SEARCH REPORT

Internal Application No  
PCT/ 03/01121

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C07C59/70 C07C317/22 C07C323/19 C07D209/10 C07D213/20  
C07D213/32 C07D261/08 C07D311/58 C07D405/12 C07D413/12  
A61K31/19 A61P3/06 A61P9/10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07C C07D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

CHEM ABS Data, EPO-Internal, WPI Data, BEILSTEIN Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication where appropriate, of the relevant passages	Relevant to claim No
X	DATABASE CA 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; 2001 NISHIMURA, KOJI: "Preparation of Indole Derivatives as Chymase Inhibitors and Drugs containing the same as the active Ingredient" Database accession no. 2001:338492 XP002258311 abstract & WO 01 032621 A (WAKUNAGA PHARMACEUTICAL CO, LTD, JAPAN) 10 May 2001 (2001-05-10) --- -/--	1,8

☒ Further documents are listed in the continuation of box C: -

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

17 October 2003

Date of mailing of the International search report

03/11/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5618 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Bedel, C

## INTERNATIONAL SEARCH REPORT

Internal ..... Application No. ....

PCT/.. 03/01121

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NANTEUIL DE G ET AL: "5-IMIDAZOL-1-YL-1H-BENZIMIDAZOLES INHIBITEURS DE L'INTERLEUKINE-1: UNE NOUVELLE VOIE POUR LE TRAITEMENT DE L'ARTHROSE" L'ACTUALITE CHIMIQUE, SOCIETE CHIMIQUE DE FRANCE, PARIS, FR, July 2000 (2000-07), pages 48-54, XP001147539 ISSN: 0151-9093 page 53; example 36; table IV -----	1
X,P	WO 02 092590 A (SIERRA MICHAEL LAWRENCE ;BESWICK PAUL JOHN (GB); RAMSDEN NIGEL GRA) 21 November 2002 (2002-11-21) claims page 124, line 25 -page 126, line 7 -----	1,2,8-15
E	WO 03 024395 A (JAPAN TOBACCO INC ;ABE HIROYUKI (JP); KAWASAKI HISASHI (JP); SPERR) 27 March 2003 (2003-03-27) figures; examples -----	1,2
A	WO 01 16120 A (DOMINIANNI SAMUEL J ;MATTHEWS DONALD P (US); MICHELLYS PIERRE YVES) 8 March 2001 (2001-03-08) the whole document -----	1,8-15

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

# INTERNATIONAL SEARCH REPORT

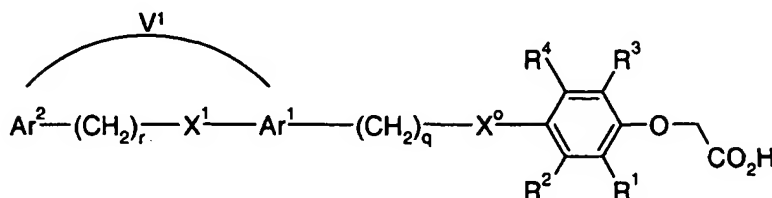
International Application No  
PCT/AU 03/01121

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 01032621	A	10-05-2001	AU 7962200 A WO 0132621 A1	14-05-2001 10-05-2001
WO 02092590	A	21-11-2002	WO 02092590 A1	21-11-2002
WO 03024395	A	27-03-2003	WO 03024395 A2 US 2003149108 A1	27-03-2003 07-08-2003
WO 0116120	A	08-03-2001	AU 7073400 A CA 2382966 A1 EP 1206457 A1 JP 2003508389 T WO 0116120 A1 US 2003045558 A1 US 6417212 B1	26-03-2001 08-03-2001 22-05-2002 04-03-2003 08-03-2001 06-03-2003 09-07-2002

Form PCT/ISA/210 (patent family annex) (July 1992)

WO2003084916  
Warner-Lambert  
PPAR

Publish date = Oct 16, 2003  
File date = March 24, 2003  
Priority date = April 5, 2002



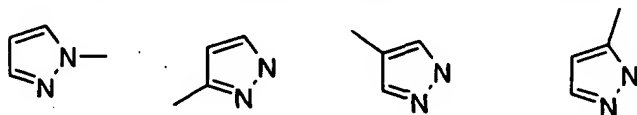
R1-R4 = H, lower alkyl (and others)  
X0, X1 = O, S, CH2, or absent (and others)  
q = 0-6  
Ar1, Ar2 = optionally substituted aryl, heteroaryl  
r = 0-6

**Definitions:**

lower alkyl = CH3

aryl = phenyl

heteroaryl (p 16): pyrazole is listed as a suitable heterocycle (and others); however, in the preferred list the pyrazole is listed as 1-, 3-, 4-, or 5-pyrazolyl. That is, it is attached to the molecule at one position (see Ex 118 below):

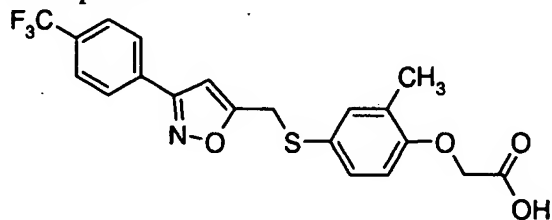


Aryl can be substituted with CF3 (and many others)

**Preferred:**

R1-R4 = H, alkyl, alkoxy where R2, R3 = H and R1, R4 = alkyl, alkoxy

**Example 45:**



**Example 118:**

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☒ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**